HelioSentry®

Installation & User's Guide

(Also Contains Instructions for the SolarSentry®)

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Revision 10J

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IMPORTANT SAFETY INSTRUCTIONS

SAVE THESE INSTRUCTIONS!

This manual contains important installation, maintenance, and troubleshooting instructions for Exeltech's HelioSentry® that shall be followed during installation and use. Failure to follow these instructions could lead to serious injury or death, or damage to equipment or property.

SAFETY SYMBOLS USED IN THIS MANUAL

SYMBOL	ASSOCIATED TERM	WHAT IT MEANS
	WARNING!	Calls attention to a potentially hazardous situation, which if not avoided, could lead to death or serious injury, and/or damage to equipment and property.
	CAUTION!	Indicates a potentially dangerous situation that may result in minor or moderate injury. May also be used to alert against unsafe practices.
	WARNING!	References information pertaining to voltages in or around the unit that are capable of causing injury or death.
	NOTE!	Designates important information required for proper installation, maintenance, and/or operation of your Exeltech HelioSentry®.

IMPORTANT!

FAILURE TO HEED THESE SYMBOLS AND THE DOCUMENTATION THEY REFERENCE COULD RESULT IN DEATH OR SERIOUS INJURY, OR DAMAGE TO YOUR PV AC MODULE(S), THE HELIOSENTRY® OR OTHER PROPERTY.

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FCC COMPLIANCE STATEMENT – EXELTECH HELIOSENTRY®

This device complies with Part 15 of the United States Federal Communications Commission Rules and Regulations. Operation is subject to the following conditions:

(1) This device may not cause harmful interference, and;
(2) This device must accept any interference received, including interference that may cause undesired operation.

NOTE: This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

	CAUTION! Alterations or modifications to the equipment not expressly approved and authorized in writing by Exeltech may cause unexpected or hazardous operation of the equipment that may void the equipment warranty and/or invalidate user's authorization to operate this equipment.

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SAFETY CAUTIONS and WARNINGS

Before installing or using the HelioSentry®, read all instructions, cautions, and warnings in this Manual and on the equipment, the PV array, and in this Installation Guide.

	WARNING! Hazardous voltages are present inside the HelioSentry®, AC Modules, and circuits that connect to the AC Modules. Contact may cause death or serious injury. To prevent electrical shock, always disconnect all power to unit(s) prior to servicing, and **NEVER** operate this equipment with the cover open.
	CAUTION! Risk of electrical shock. Do not remove HelioSentry® cover unless qualified to do so. No installer, user or operator serviceable parts exist inside. Refer all service to a factory service technician or qualified service personnel.
	NOTE! This equipment is bonded to protective earth (safety ground) through the utility ground. This connection must be established prior to operating the HelioSentry®. The ground wire should be #12 AWG copper or larger, or sized as appropriate within your local jurisdiction electrical code. If uncertain, check with your local code enforcement office for their requirements. Input and output circuits are isolated from the enclosure. System grounding as required by the National Electric Code are the sole responsibility of the installer. AC output neutral is not bonded to ground within the HelioSentry®. This must be done at the service entry panel to which this unit is connected.
	NOTE! For domestic US installations, all electrical work must be done in compliance with local electrical codes and the NFPA 70 National Electrical Code.
	NOTE! Do not connect the HelioSentry® into any AC circuit containing ground-fault protective devices. Ground-fault protection devices are not designed for back-fed power and may not function properly, or may be damaged.

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INTRODUCTION

Thank you for purchasing Exeltech's HelioSentry®, one of our expanding line of products in the power conversion and solar energy industries. Exeltech strives to manufacture products of the highest possible quality, and is dedicated to 100% customer satisfaction. The HelioSentry® is 100% AMERICAN MADE in our Fort Worth, Texas facilities.

We welcome you as a customer to the EXELTECH family. CONGRATULATIONS!

PRODUCT OVERVIEW

The HelioSentry® is a sophisticated data interface designed to receive signals from Exeltech's AC Modules and display their performance and related information on a self-contained readout in the HelioSentry®. The HelioSentry® will also interface with your computer, allowing you to download and store data, view a real-time presentations of your Exeltech PV AC Modules' performance, provide system diagnostics of your PV AC Module system, and more.

Up to 20 PV AC Modules may be connected to one HelioSentry®. Ten Modules are permitted for each AC phase of the HelioSentry® input. To ensure balanced power delivery to the utility grid, an equal number of PV AC Modules should be connected to each input phase of your HelioSentry®. If more than 20 PV AC Modules are to be connected, two or more HelioSentry® units must be used.

The HelioSentry® is equipped with an integral AC disconnect and lockout switch. This switch is rated for a maximum of 20 amps per phase. This switch may be used to disable Exeltech PV AC Modules in the event servicing or other dead-circuit activity is needed.

The switch lockout feature is enabled by turning the switch to the "OFF" position, then inserting a lock into the base of the knob. When a lock is inserted, the switch may not be returned to the "ON" position until the lock is removed.

DESCRIPTION OF OPERATION

Exeltech's HelioSentry® connects to our PV AC Modules via the AC power cable from the AC Modules. AC Modules transmit a special low-power digital signal over the power cable, which in turn is received by the HelioSentry®. This information allows monitoring of your PV AC Module system performance, as well as displaying system diagnostics. See the Software Manual accompanying this Instruction Manual for a more detailed description of the display and other functions.

The SolarSentry® is identical to the HelioSentry® in appearance, but is supplied with only two external sensors; one for measuring light intensity (irradiance) and the other (internal to the irradiance sensor) measures the approximate temperature of the photovoltaic module to which it's attached. The HelioSentry® is supplied with a total of six sensors; the same irradiance and temperature sensors as the SolarSentry®, but also includes two current sensors for measuring power in and out of your home or business, and two additional temperature sensors – one for ambient temperature near the Sentry, the other for internal temperature of your home or office (or other location of your choosing).

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SPECIFICATIONS

ELECTRICAL SPECIFICATIONS

Nominal Operating Voltage (ac)	120/240 Vac, 60 Hz
HelioSentry® Power Consumption	25 watts (0.2 amps)
PV AC Module Input – Array #1	Line1-Neutral-Ground
Maximum PV AC Module Current for Array #1	20 A rms
PV AC Module Input – Array #2	Line2-Neutral-Ground
Maximum PV AC Module Current for Array #2	20 A rms
Maximum Pass-through Current from PV AC Modules	20A per phase (40A total)
Maximum Number of Phases Per Unit	2
Internal Disconnect Switch	Opens Line 1 and Line 2
Disconnect Switch Ratings	20A, 250Vac (ETL Certified)
Operating Voltage Range (AC)	106-132V
AC Operating Frequency Range	59.3 Hz – 60.5 Hz
Maximum Output Overcurrent Protection Required Per Phase	20 A
Operating Temperature Range	-40°C to +55°C (-40F to +131F)

MECHANICAL SPECIFICATIONS

Dimensions	7.5” (190 mm) x 6.5” (165 mm) x 3.5” (89 mm)
Weight	6 lbs (2.7 kg)
Cooling	Natural Convection
Enclosure	Fully sealed NEMA 4X (IP64)

ENVIRONMENTAL SPECIFICATIONS

Storage Temperature	-40℃ to +55℃ (-40℉ to +131 ℉)
Operating Temperature	-40℃ to +55℃ (-40℉ to +1 31℉)
Storage Relative Humidity	0 to 100%
Operating Relative Humidity	0 to 100%
Storage Altitude	-500 feet to 10,000 ft (-150m to 3,050m)
Operating Altitude	-500 feet to 10,000 ft (-150m to 3,050m)

AGENCY COMPLIANCES

FCC	Federal Communications Commission Title 47 CFR, Part 15, Class A & B
UL1741	Standards for Inverters, Converters, Controllers and Interconnection System Equipment for Use With Distributed Energy Resources.
UL 601010-1	Safety Standards for Data Display Equipment
CAN/CSA-C22.2	CAN/CSA-C22.2 No. 61010-1
Surge	IEEE C62.41 Level C Standards for Surge Protection.

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WARRANTY

Exeltech is proud of the technology and workmanship of our products. Exeltech warrants your HelioSentry® to be free of defects in material and workmanship for a period of 5 years from date of installation (warranty registration required). Exeltech will, at its option, replace or repair parts found defective under the terms of this warranty, and return equipment or parts to the purchaser.

The above stated warranty does not apply to products which have failed due to improper installation, misuse, alteration, unauthorized repair or modification, or acts of God.

The purchaser is responsible for transportation costs of the equipment to and from the distributor or dealer for warranty repair or replacement.

The above warranty does not include incidental or consequential damages and Exeltech disclaims any liability for any such damages. All implied warranties, if any, are limited in duration to the above stated five year warranty period. Some states and provinces do not allow the exclusion or limitation of incidental or consequential damages or a duration for an implied warranty, so the above limitations may not apply to you. All liability is limited to the original purchase price of the HelioSentry®.

UNPACKING and INSPECTION

Open the package and confirm that the product conforms to your order. Also, check each of the following points for any problems. If any problems or discrepancies are noted, contact your dealer or distributor immediately.

On receipt of the HelioSentry®, inspect the outer package and the contents for signs of damage. If there is shipping damage, contact the carrier, and return the unit to the factory.

1. Check that the model number indicated on the nameplate conforms to the specifications of your order.

2. Check that all accessories that you ordered are included with your shipment.

3. Check that the HelioSentry® enclosure and any accessories have not been accidentally damaged in transit.

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INSTALLING THE HELIOSENTRY®

SELECTING A MOUNTING LOCATION

NOTE! The installer is solely responsible for:

1) Complying with all applicable local or national building codes, including any that may supersede this manual;
2) Using only those parts supplied with the HelioSentry® or as specified in this Manual;
3) Ensuring safe installation of all mechanical and electrical aspects of the HelioSentry®.

WARNING! Do not install the HelioSentry® in areas where flammable materials or explosive vapors may exist.

CAUTION! Avoid environments that expose the HelioSentry® to vibration, large amounts of dust, heavy icing, hail, water immersion, etc. Though the HelioSentry® is designed with a NEMA 4X rainproof enclosure, try to avoid locations with splashing water, bilge, battery acid, battery fumes, or other hazards.

CAUTION! The HelioSentry® must be mounted vertically, **four or more feet (1.2 meters) above the ground**, with the conduit openings oriented downward. Do **NOT** mount the HelioSentry® where it could be sprayed by water from sprinklers or other sources. See Illustration 1 on page 13 ("Knockouts"), and Illustration 2 ("Orientation") on page 15.

NOTE! Follow all national local electrical codes when selecting a mounting location. Consult the NFPA 70 National Electrical Code for requirements.

The mounting location selected for your HelioSentry® must comply with the National Electric Code and your local safety and building codes.

Your HelioSentry® is housed in a weather-tight NEMA 4X enclosure, and may be mounted in either interior or exterior locations. If exterior, a shaded protected location is recommended. Though the HelioSentry® is not specifically heat-sensitive, cooler operation will enhance the reliability of the display and other electronics. The north side of a building or other structure is ideal. The east or west sides respectively are acceptable, but less preferable. The south side, particularly if in the sun, is the least preferred. See also the Note on page 12 pertaining to metal surfaces and materials.

The HelioSentry® must be properly secured to the surface to which it's attached. The HelioSentry® must also be oriented with the conduit openings downward.

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PREPARING THE HELIOSENTRY® FOR INSTALLATION

WARNING! Before proceeding, ensure the steps below have been performed:

1. Disconnect AC Power from any point of attachment prior to connecting PV AC Modules. Open all circuit breakers to which the HelioSentry® will connect.
2. Do not exceed the maximum allowable backfeed current rating for your electrical service.
3. Use only 12AWG solid or stranded copper wire to connect your HelioSentry® to your service entry panel or sub-panel.
4. If cable runs penetrate the exterior of the building, the National Fire Protection Code lists metallic conduit as the preferred means. Adhere to your local building codes.

CAUTION! To reduce the risk of fire, connect the HelioSentry® output only to a dedicated circuit provided with 20 amperes maximum branch-circuit over-current protection in accordance with the National Electrical Code, ANSI/NFPA 70.

WARNING! To reduce the risk of fire, do not connect to an ac load center "circuit breaker panel" having multi-wire branch circuits connected.

NOTE! When tools are needed for a particular step, they will be noted in square brackets "[ ]" preceding the instruction(s) for that step.

NOTE! Avoid installing the HelioSentry® on or near surfaces involving stucco, metal siding, foil, metal screens, or other metallic materials. These may cause erratic communication of the wi-fi system, or even prevent it altogether. Locate the HelioSentry® as close to the Internet router as possible. An external antenna may be required on the router for improved wi-fi reliability.

TOOLS AND MATERIALS RECOMMENDED FOR INSTALLATION

1. UL or other agency-approved wire stripper (appropriate size for wire gauges used).
2. Drill and bits of appropriate size and type for selected mounting screws.
3. Screwdrivers: #2 Philips screwdriver; short-shank flat or Philips.
4. Vise-grips®, channel-lock, or similar pliers for compressing cable connector shells.
5. Adjustable-jaw pliers.
6. Utility knife.
7. Wrenches (crescent, socket, etc., of appropriate size to fit the mounting hardware).

[Screwdriver, short shank]

Refer to Illustration 1 on page 13. (Enclosure bottom showing knockouts.)

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With the HelioSentry® oriented for a clear view of the bottom, secure the enclosure appropriately for the removal of knockout plugs as needed. (Knockouts are generally more easily removed before the enclosure is attached to any surface.)

Locate the five knockouts in the enclosure. The three large knockouts are ¾" in diameter suitable for standard conduit. The two smaller knockouts are reserved for installation of future options.

With a short-shank screwdriver, remove the rightmost large knockout (labeled #1) from the HelioSentry® enclosure. This is the knockout farthest from the hinge, and is the exit point for conductors from the HelioSentry® leading to your service entry panel. Use care to avoid penetrating the enclosure too far as this may damage the printed circuit board above the knockouts.

For PV AC Module arrays using only one 120V phase, you need remove only the large knockout in the center (labeled #2). This will connect between one "line" side of the breaker panel and neutral. Either of the "line" sides of the circuit breaker panel are suitable for this connection.

For PV AC Module arrays using both phases, remove all three ¾" knockouts.

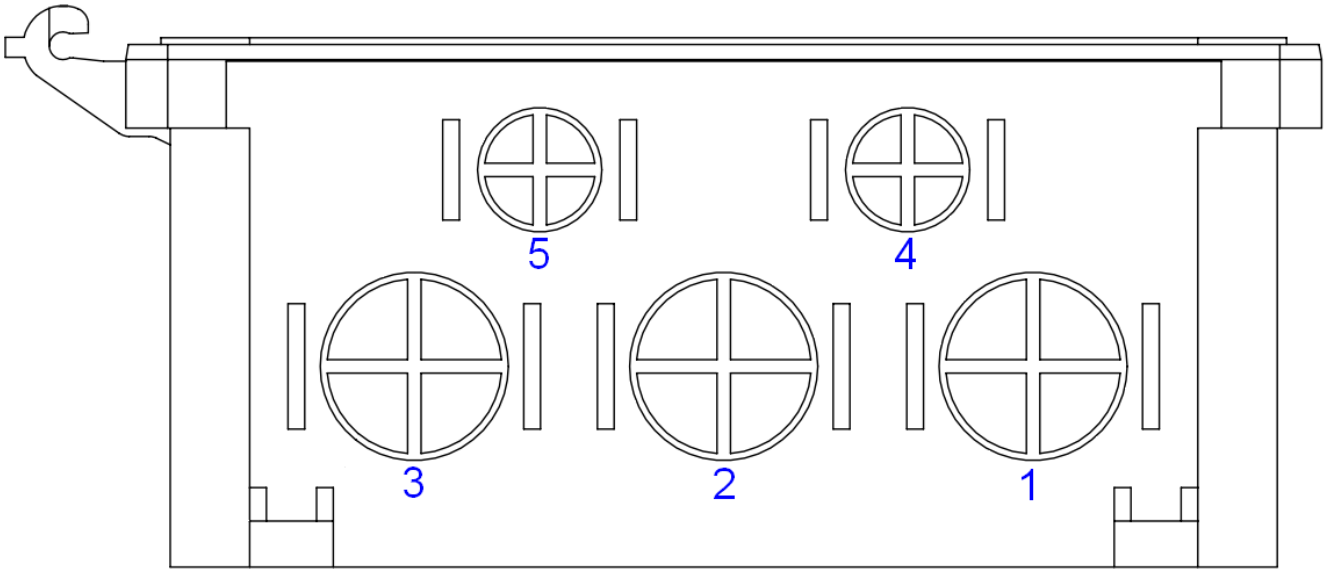

ILLUSTRATION 1
HelioSentry® Knockouts
(Note the right-to-left numbering sequence.)

For attaching cables to the HelioSentry®, use only ETL/UL or other agency-approved cable and conduit hardware designed for that purpose.

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HELIOSENTRY® INSTALLATION

If you do not understand the instructions or steps required herein, seek assistance from qualified personnel.

Additional information required for installation may be found in the National Fire Protection Association Publication NFPA70, known as the National Electrical Code., any state building codes, and any applicable local codes.

The following instructions are for use in conjunction with HelioSentry® Installation Figures on the following pages. To ensure a safe, reliable installation, please comply with the instructions as specified, and in the order presented.

	CAUTION! Ensure AC conductors have no voltage present. Open all AC circuit breakers and verify zero volts are present in all circuit before proceeding!

	NOTE! Use only agency-approved weather-tight conduit and cable clamps. Use of any other hardware is not recommended and may lead to unsafe operation of your HelioSentry®.

	NOTE! For exterior installations where conduit may be used, weather-tight conduit fittings complying with requirements in the “Standard for Fittings for Conduit and Outlet Boxes, UL 514B”, must be used. In such event, install conduit couplings as required by your local Electrical Code.

HELIOSENTRY® LOCATION AND ORIENTATION

The HelioSentry® should be located as near to the circuit breaker panel as possible. Less than ten feet (3 meters) is highly recommended.

The HelioSentry® may be mounted flush and secured vertically to almost any surface. This includes, but is not limited to brick, masonry, stucco, wood, or siding (any type). It is not recommended to mount the HelioSentry® in any hot location, as this may adversely affect the life of the HelioSentry®. Select a location that’s four or more feet (1.2 meters) above the ground.

	NOTE! The HelioSentry® does not require special ventilation or cooling. However, a cool location will help prolong the life of the enclosed electronics.

Refer to Illustration 2 on page 15 (HelioSentry®, front view).

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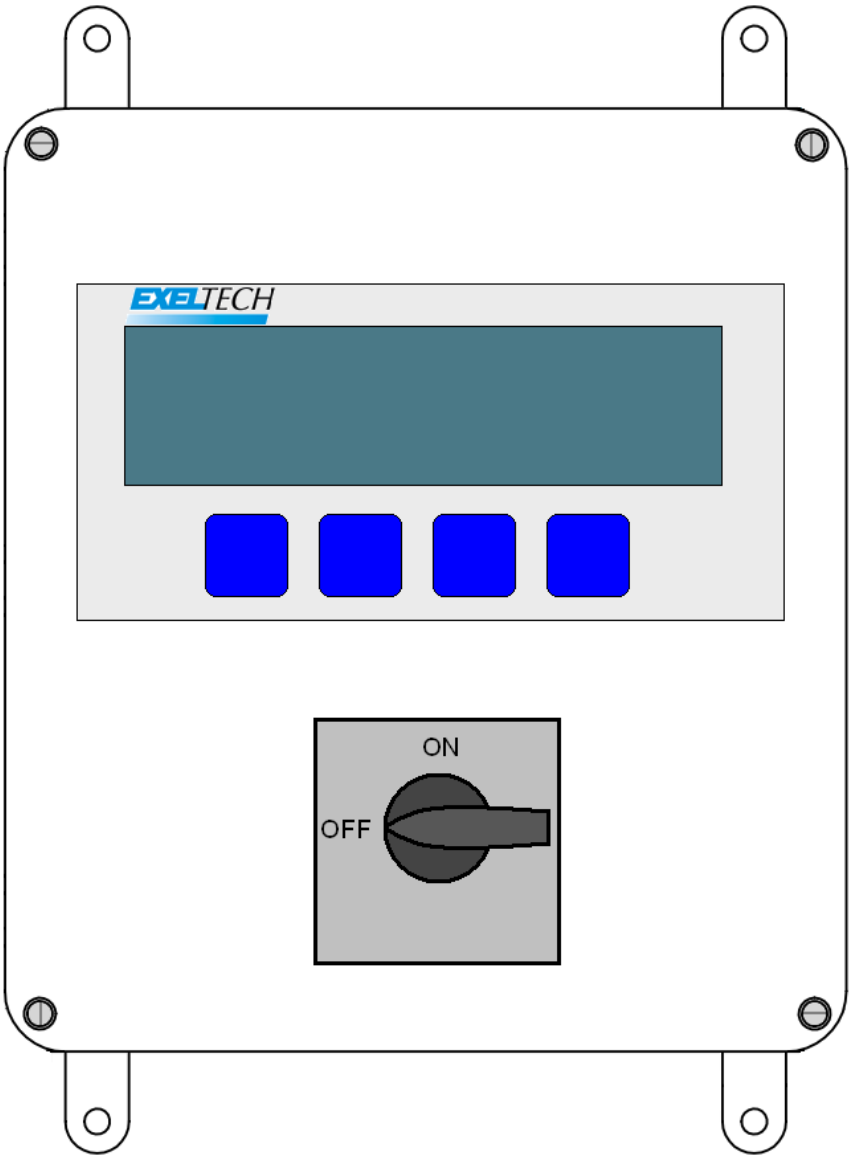

ILLUSTRATION 2
HelioSentry®, Front View

Note the four mounting tabs at the corners.

Use four #10 screws of a type and length appropriate for the surface you've selected for mounting of your HelioSentry®. Screws should be at least 1" long. Insert and tighten screws through each of the four enclosure mounting tabs. Ensure the screws are snug. Do not over-tighten the screws, as this may result in fracturing the plastic tabs.

You are now ready to connect the HelioSentry® to the utility.

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CONNECTING YOUR HELIOSENTRY®

	WARNING! Hazardous voltage exists inside your circuit breaker panel. Failure to follow these instructions could lead to serious injury or death. An electrician or other qualified professional may be required to complete the installation of your HelioSentry®.

	CAUTION! Your local building codes may require final installation and connection be performed by a licensed electrician or other qualified personnel. Read these instructions completely before preceding with installation.

[Voltmeter, screwdriver, wire cutters, wire strippers.]

With a digital voltmeter or similar device, again ensure all AC power has been fully removed from the circuit(s) to which the HelioSentry® will be connected.

Refer to Illustration 2 on page 15 (HelioSentry®, front view). Ensure the HelioSentry® power switch is in the “OFF” position as shown.

Remove the four screws holding the cover to the HelioSentry®. Place them in an area for safekeeping. Note the hinges on the HelioSentry®. The cover opens to the left.

Gently open the HelioSentry® cover. Use care not to place any undue stress on the cables connected to the switch or display.

Refer to Illustration 3 on page 18. Locate and identify each of the following in the Sentry:

Connector P104. This is the connecting point for Line 1, Line 2, Neutral, and Ground. If you are using only one phase (one string) of PV AC Modules, Line 2 will not be used at this time.

Connector P106. This is the attachment point for the first phase of PV AC Modules. Do not attach more than one cable to this connector. Use maximum 12 AWG copper conductor. Do not exceed 20 amps of current into this connector (limit of 10 PV AC Modules).

Connector P107. This is the attachment point for the second phase (second string) of PV AC Modules. The same restrictions apply as for connector P106.

Refer to Illustration 3a on page 19. Locate and identify each of the following (highlighted in green):

Connector P101. This is the attachment point for each of the two clamp-on utility current sensors.

Connector P305. This is the attachment point for the external temperature sensor.

Connector P501. One lead of the irradiance sensor connects here. It shares a ground with the temperature sensor on P305. Do not use the “Black” connection point on P501.

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Refer to Illustration 1 on page 13.

Knockouts number 4 and number 5 will have been removed at the factory, and two cable grips installed at these location. They are for insertion of the sensor leads.

Loosen but do not remove the exterior jam nut on each of the grips at locations 4 and 5.

Carefully strip and remove approximately 6 inches of the outer jacket from the irradiance sensor cable. Use care not to nick, cut or otherwise damage the inner conductors.

Insert the irradiance sensor leads into the cable grip at location #5. Allow sufficient length of inside the HelioSentry® for attachment to P501 and P305. Cut off any excess. Carefully strip approximately two inches of the outer jacket. Use care not to nick or cut the internal wires. Remove approximately ¼" of insulation from each of the four wires.

Refer to Illustration 3b on page 20.

With a small flat-blade screwdriver, loosen the screw (counter-clockwise) for the "GRN" (green) attachment point of P501. Insert the green conductor and snug the screw. Do not over-tighten. Do not insert any other leads into P501.

Loosen the screws in P305. Route the red, yellow, and black insulated wires from the exterior irradiance sensor to P305.

If you have a Solar Sentry®, insert the three wires and snug each screw, then skip to page 21 to continue installation. (A Solar Sentry® comes with only one sensor to measure light intensity and PV temperature.) For the HelioSentry®, do not insert any wires into P305 at this time.

Refer to Illustration 1 on page 13.

Route the "external" temperature sensor wire through the cable grip at location #5.

Sensor leads for interior and ambient temperature sensors may be routed through the conduit feeding the service entry panel or one of the small cable grips, as convenient. Route utility current sensors from the breaker panel should through the service entry panel conduit.

Strip and remove two inches of the outer jacket from each of the remaining temperature sensors. Remove approximately ¼" of insulation from each of the internal conductors. Twist all three the conductors for the RED leads together. Insert them as shown in Illustration 3b (page 20). Snug the screw. Don't overtighten. Repeat for YELLOW and BLACK wires.

Utility Current Sensors

Utility current sensors clip around "Line 1" and "Line 2" in the service entry panel with the "label" side toward the utility meter. Clip one current sensor around Line 1. Clip the other around Line 2. Sensors should be attached at a point between the panel buss and the utility meter with the label-side toward the utility meter. Route sensor leads through the service entry panel where the Sentry conduit is (or will be) attached, through the conduit, and into the Sentry. Sensor #1 attaches to P101-L1. Sensor #2 goes to P101-L2. Remove approximately 1" of outer jacket from each sensor cable. Strip approximately ¼" of insulation from each wire. Loosen P101 screws. Insert wires as shown in Illustration 3b. Snug but do not over-tighten the screws.

Read and note the information on pages 18-20. Installation instructions resume on page 21.

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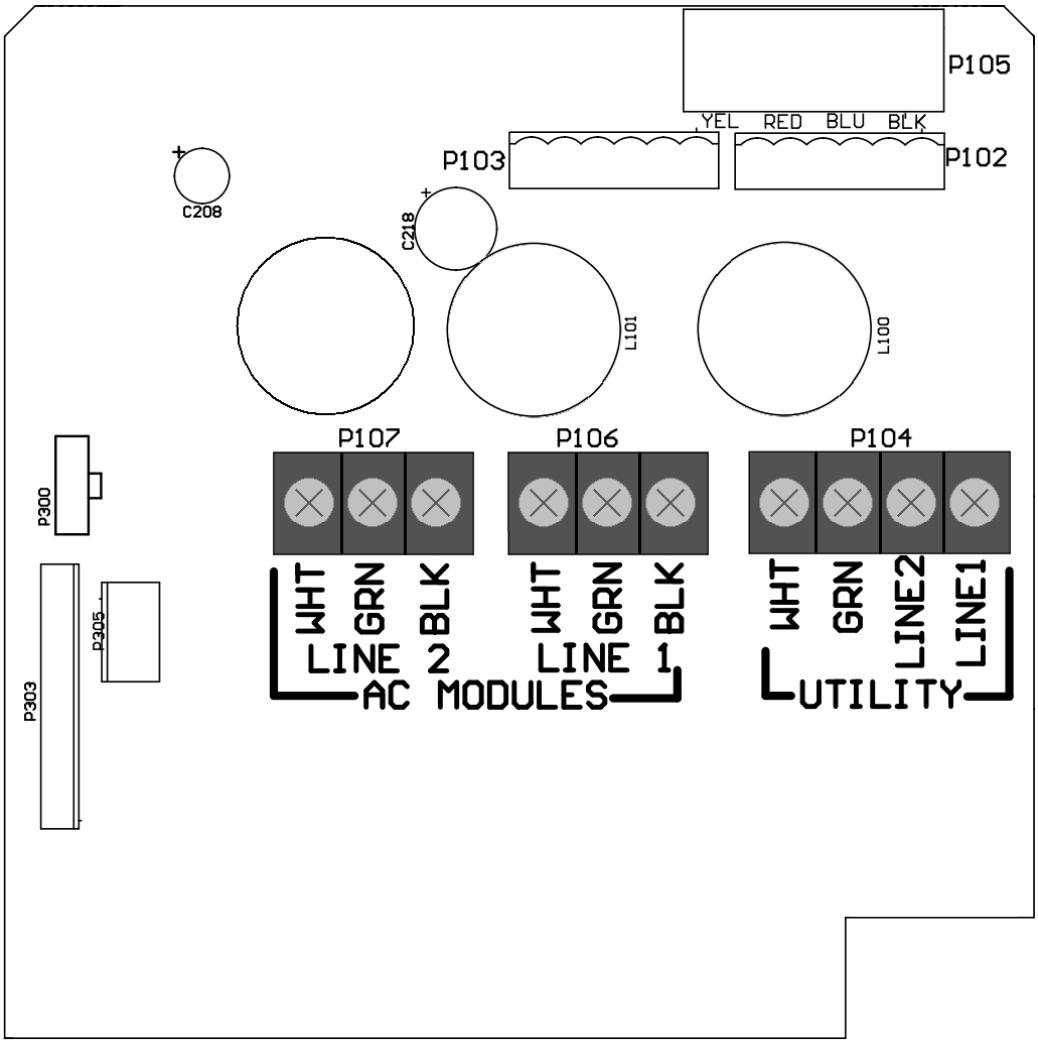

ILLUSTRATION 3
HelioSentry® Internal Power Connections

	NOTE! All “Utility” power line connections attach to connector P104 (rightmost connector).

The first phase (Phase #1, also called “Line 1”) of PV AC Modules attach to P106 (center connector).

The second phase (Phase #2, also called “Line 2”) of PV AC Modules attach to P107 (leftmost connector).

Do not tamper with or alter any other electrical connections or parts.

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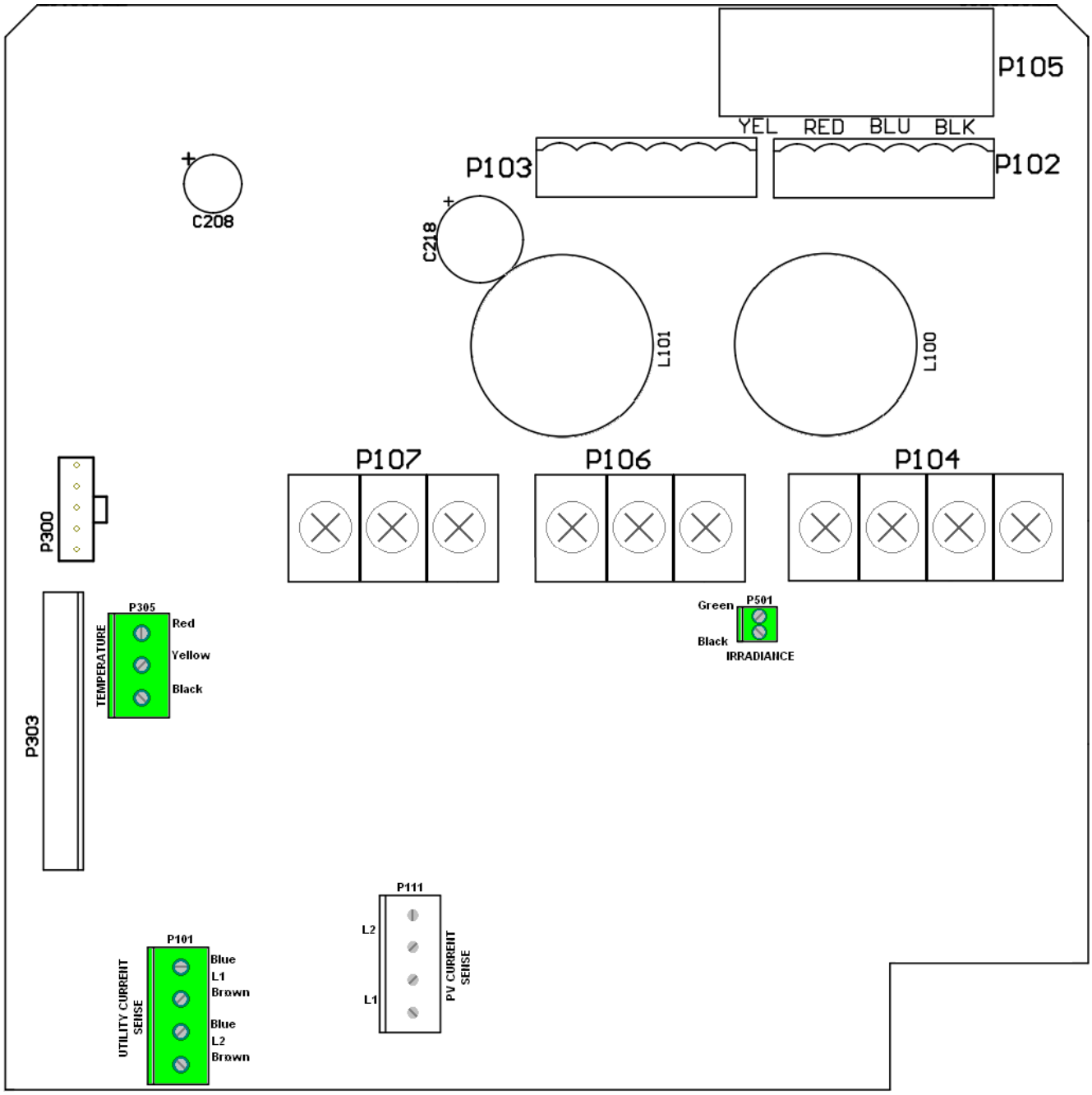

ILLUSTRATION 3a
HelioSentry® Internal Sensor Connections (highlighted in green)

	NOTE! Connector P111 will have wires already inserted into it. Do not tamper with these wires. They are not part of the user-installable sensors.
	NOTE! (For HelioSentry® installations only.) Install the clamp-on current sensors with the LABEL side toward the utility meter. Reversing one or both will result in consumed and backfed power being misread by the HelioSentry®.

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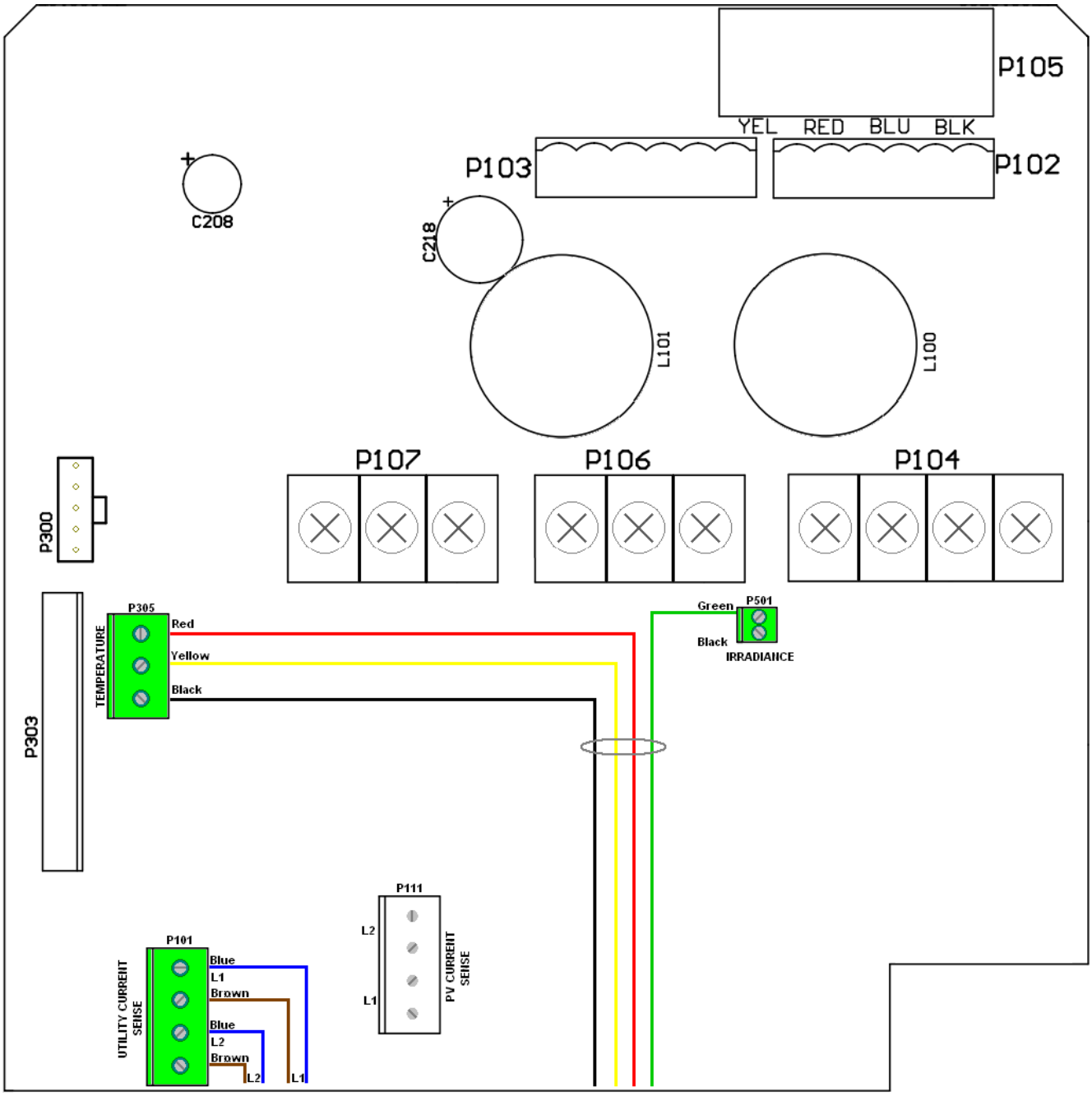

ILLUSTRATION 3b

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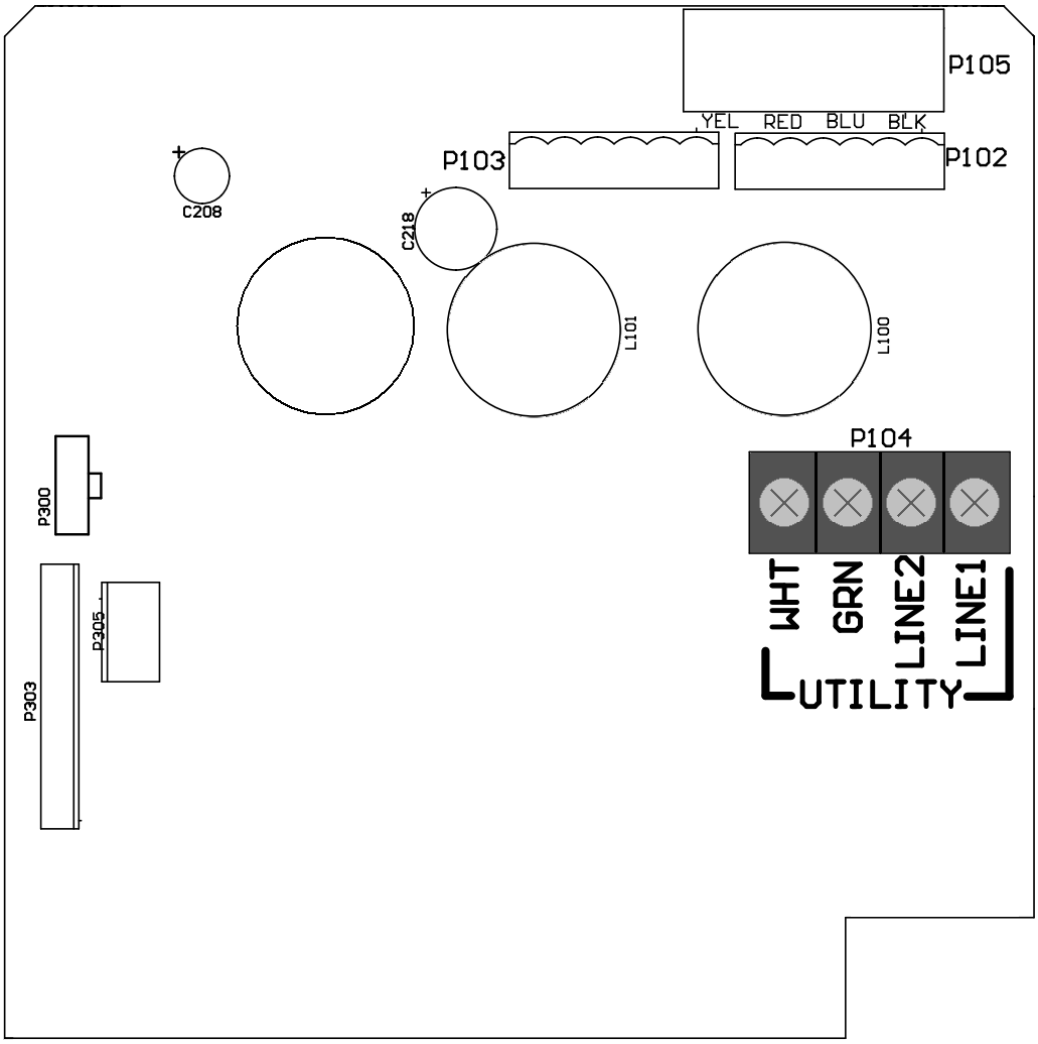

ILLUSTRATION 4
HelioSentry® Utility Connections

Refer to Illustration 4 above.

Use individual 12 AWG copper conductors (solid or stranded as required by your local electrical code). Insert the conductors through an agency-approved cable grip designed for this purpose, and attach to P104 in the following order:

1) "Ground" (a green insulated conductor) to "GRN".
2) "Neutral" (a white insulated conductor) to "WHT".
3) "Line 1" (a black insulated conductor) to "LINE1".

Complete step 4 only if you are connecting more than ten PV AC Modules, or you have two separate runs of cable from your PV AC Module array, or you anticipate adding to your system and will need LINE 2. Otherwise, leave "LINE 2" empty.

4) "Line 2" (use a red insulated conductor or as required by code) to "LINE 2" on connector P104.

When finished, ensure all internal cables and wires are positioned toward the center of the unit and well clear from the cover. Reinstall the cover screws and torque them to 16 inch-lbs. Do not overtighten.

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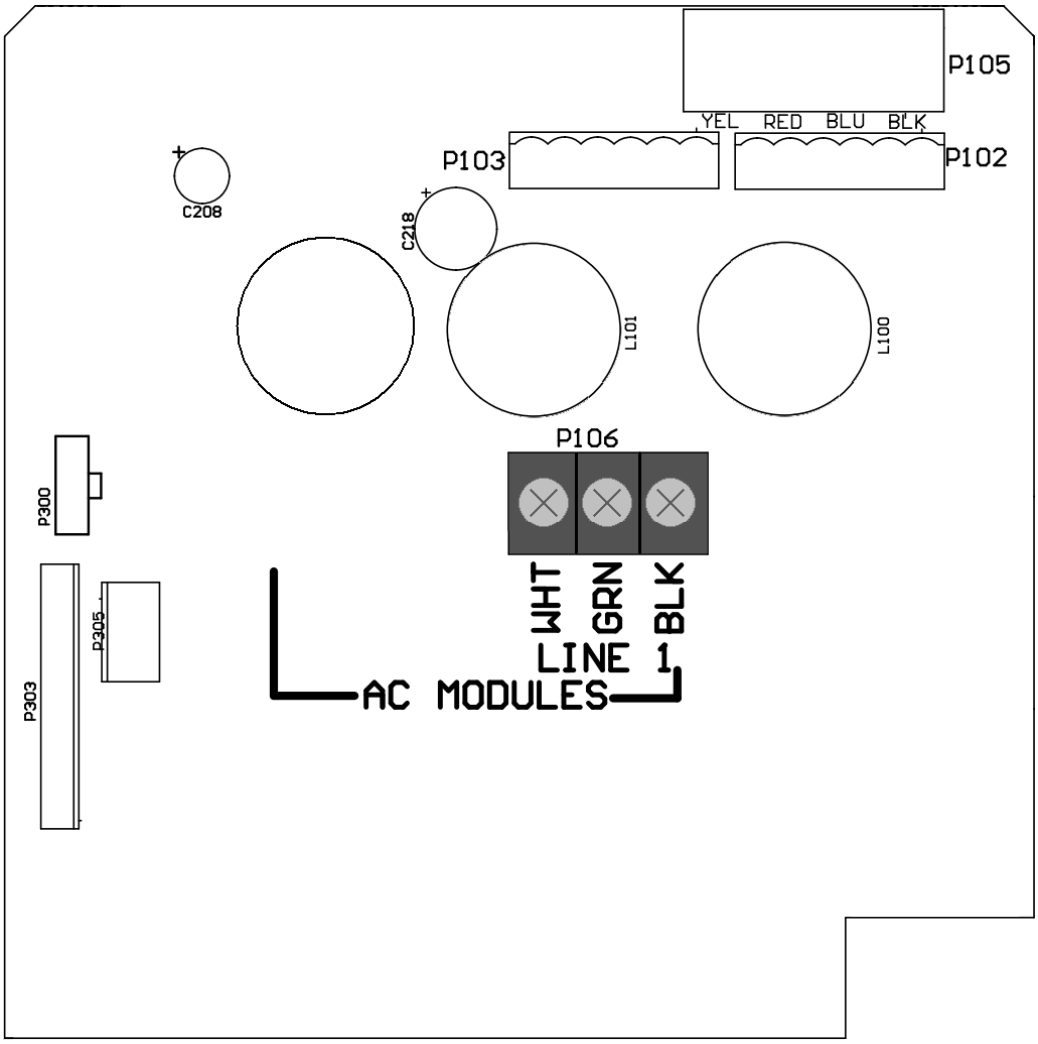

ILLUSTRATION 5
HelioSentry® Array #1 Connections (Neutral, Ground, Line 1)

Refer to Illustration 7 on page 23 (Home Run Cable).

Attach the conductors to P104 in the following order:

1) "Ground" (a green insulated conductor) to "GRN".
2) "Neutral" (a white insulated conductor) to "WHT".
3) "Line 1" (a black insulated conductor) to "LINE1".

Torque connector screws to 10-12 inch-lbs. Do not overtighten.

If using conductor other than the factory "Home Run" cable (Illustration 7, page 23), the same color connection scheme applies in accordance with the National Electric Code.

Solid or stranded wire may be used. Contact your local code authority for verification of the type of cable required in your area.

When finished, ensure all internal cables and wires are positioned toward the center of the unit and well clear from the cover. Reinstall the cover screws and torque them to 16 inch-lbs. Do not overtighten.

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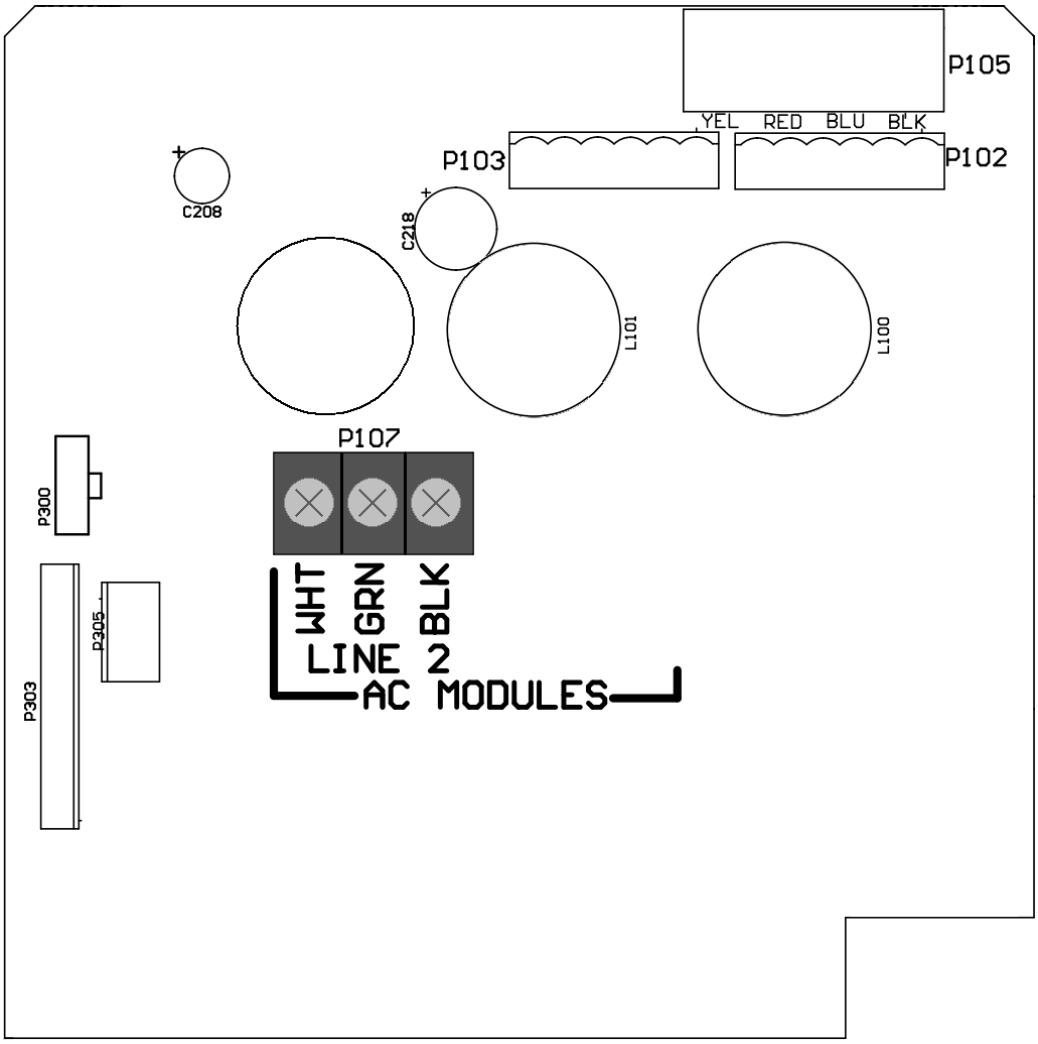

ILLUSTRATION 6
HelioSentry® Array #2 Connections (Neutral, Ground, Line 2)

[Voltmeter, screwdriver]

If connecting a second group of up to 10 PV AC Modules to the HelioSentry®, use P107 (above) for this purpose.

Turn off all AC power to the HelioSentry® by opening the circuit breaker(s) to which the HelioSentry® is connected. Verify all AC power is off. Remove the screws holding the cover of the HelioSentry® to the enclosure. Save them in a safe location.

Follow the connection instructions on page 19 for the first phase, but substitute P107 as the connection point.

When finished, ensure all cables and wires are positioned toward the center of the unit and well clear from the cover. Reinstall the cover screws and torque them to 16 inch-lbs. Do not overtighten.

Restore power to the HelioSentry® per the instructions on page 24.

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GROUNDING

NOTE! Your state and/or local building codes may supersede the grounding requirements contained in this Manual. It is the installer's sole responsibility to ensure full compliance with all applicable electrical codes in your area.

CAUTION! DO NOT CONNECT MORE THAN 10 PV AC MODULES TO ONE CIRCUIT, AND NO MORE THAN 20 PV AC MODULES TO ONE HELIOSENTRY® USING LINE-NEUTRAL-LINE CONNECTIONS! IF YOU WISH TO INSTALL MORE THAN 20 PV AC MODULES, USE SEPARATE HOME RUN CABLES FOR UP TO 10 MODULES PER CIRCUIT, AND MULTIPLE HELIOSENTRY® UNITS AS APPROPRIATE FOR THE NUMBER OF PV AC MODULES INSTALLED.

CAUTION! Do not exceed the amperage rating of the circuit box to which the HelioSentry® is connected. Consult the National Electric Code or your local Code Safety Inspector for the applicable rules and regulations in your area..

CABLING

"Home Run Cable" – End View

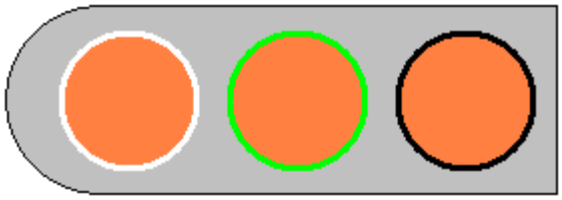

ILLUSTRATION 7

The "Home Run" cable is custom-designed specifically for the purpose of attaching up to 10 PV AC Modules in parallel. The white-insulated wire is "Neutral"; green is "Ground"'; and black is "Line". If you've used the "Home Run" cable, Illustration 7 is applicable. If not, the wire insulation color coding is still pertinent.

The BLACK insulated conductor in the cable is the "LINE" connection for this phase. The WHITE insulated conductor is "Neutral". The GREEN insulated conductor is protective earth ground. The neutral conductor must be bonded to earth ground at your service entry.

Secure the Home Run cable from the last PV AC Module. Your local building codes may require that this cable be in conduit. Though the cable supplied is UL-rated for outdoor use without conduit, your local codes may override any instructions in this Manual.

If your HelioSentry® is installed at an external location, penetrating your roof or wall with this cable may require metal conduit. It is the installer's responsibility to ensure all national and local codes are observed in the installation of this system.

NOTE! See TABLE 1 for the maximum length of home run cable versus the number of installed PV AC Modules.

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TABLE 1 – Home Run Cable Length for Number of Installed PV AC Modules.

Home Run Length in Feet	Maximum # of AC Modules
150’	5
125’	6
110’	7
100’	8
85’	9
75’	10

Note: Table 1 assumes 120V ac (rms) at the point of connection of the far end of the Home Run cable, an ambient temperature of 50°C, and ap proximately 5 volts (rms) or less voltage rise due to the backfed current.

In all cases, for reliable communication to a HelioSentry®, the maximum Home Run cable length should be limited to 150 feet or less. Cable length is defined as the cable as the point measured from the last PVAC Module farthest from the utility connection.

Do not connect more than 10 (ten) PVAC Modules to one Home Run cable, irrespective of the length of that cable. For installation of up to 20 PVAC Modules, use two runs of Home Run cable.

COMMISSIONING YOUR SYSTEM

After all internal connections have been verified, close the door on your HelioSentry®. Insert the screws and torque them to 12 inch-pounds. DO NOT OVERTIGHTEN!

Turn on any circuit breakers that connect the HelioSentry® to the utility grid.

Observe the utility power meter. With sufficient sunlight, your PV AC Modules will begin generating power approximately five minutes after utility power is applied to the system. If you are consuming very little power, and the energy generated by the PV AC Module(s) exceeds your consumption, your electric meter may begin turning backwards.

No other steps are needed to activate your system.

For temporary access of your PV AC Module system, you may use the Disconnect Switch located on the front of your HelioSentry® to disconnect all AC Power from the system. This switch has been fully ETL certified for this purpose.

In the alternative, or for work on the HelioSentry® itself, turn off all circuit breakers to which the HelioSentry® is connected. Do this BEFORE starting any work on the HelioSentry® or the PV AC Module system(s).

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INSTALLATION OF MULTIPLE AC MODULES

Up to ten PV AC Module inverters may be paralleled on one common cable, and then connected to one or more HelioSentry® units. Additional PV AC Modules must use separate dedicated conductors from each system to the AC disconnect panel. A HelioSentry® will accept a maximum of two arrays of ten PV AC Modules.

Each system's AC output must have its own circuit breaker in the service entry or sub-panel to which it's connected. Do not exceed 20 amp breakers per circuit.

	NOTE! The combined output power of multiple inverters may not exceed the service rating of the circuits to which the inverters are connected. Consult ANSI/NFPA 70: The National Electrical Code for guidance.

	WARNING! PV AC Modules are provided with fixed trip limits and shall not be aggregated above 30 kW on a single Point of Common Connection.

ACTIVATING YOUR PV AC MODULE INVERTER SYSTEM

	WARNING! Obtain full inspection approval from your local electrical inspector or other Authority Having Jurisdiction over electrical wiring inspections before activating the inverter.

	NOTE! Safety standards applicable at the time of manufacture of the PV AC Modules mandate a minimum five-minute delay after fully activating the inverter(s) before power is produced. Inverters must be connected to the utility grid before any power will be generated. At least five minutes will be needed before any data will begin displaying on your HelioSentry®. This is normal.

Refer to Illustration 2 on page 15 (HelioSentry® front panel view). Turn the switch to the "ON" position. A self-test message should appear in the display window, followed shortly by the display for PV AC Module status.

The UL 1741 Safety Standard to which the PV AC Modules have been certified requires a minimum five minute period after power is restored before they can begin generating any power. Due to the nature of the data reporting , your HelioSentry® may require up to 10 minutes or more before meaningful data begins to appear.

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MAINTENANCE

The HelioSentry® does not require any cleaning or maintenance. Do not use solvents or any other cleaning agents on the HelioSentry® enclosure or display.

TROUBLESHOOTING

	The HelioSentry® contains no user serviceable parts. All troubleshooting must performed by qualified service personnel only.

There is very little to go wrong in your HelioSentry®. If your HelioSentry® display does not appear when the switch is in the "ON" position, check the following:

Did you turn on all circuit breakers connected to the HelioSentry®? The HelioSentry® will not function if the breaker connected to "LINE 1" is not closed and power is applied.

Are the PV AC Modules illuminated? If no data is received (for example at night), the HelioSentry® won't display any active power.

If you should experience difficulty after the HelioSentry® has been installed and in operation, check the circuit breakers to which the HelioSentry® is connected. If any are "tripped", this may indicate an overload or excessive current flow in that circuit. If so, reset the suspect circuit breaker. If it trips again, contact your local installer, an electrician, or other qualified professional.

If the above items are met, and you still are experiencing difficulty, contact your installer or Exeltech for further assistance. Our Customer Service Department is open from 8:00 am to 5:30 pm Central Time, Monday through Friday. We accept telephone calls during those hours. All calls are answered by our Customer Service Staff at our headquarters in Fort Worth, Texas, USA.

In the alternative, you may e-mail questions or concerns to the Technical Support link on the "Contact Us" page on our website (listed below).

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Fort Worth, Texas 76118-7100 USA
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www.exeltech.com

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SAFETY COMPLIANCE STATEMENT – EXELTECH HELIOSENTRY®

The Exeltech HelioSentry® has been tested by Nationally Recognized Testing Laboratories and found to be fully compliant with the following Standards:

Federal Communications Commission
Title 47 CFR, Part 15, Level B of the United States Federal Communications Commission Rules and Regulations.

Surge IEEE C62.41 Class B Standards for Surge Protection.

UL1741 Standards for Inverters, Converters, Controllers and Interconnection System Equipment for Use With Distributed Energy Resources.

UL 601010-1 Safety Standards for Data Display Equipment.

CAN/CSA-C22.2 The HelioSentry® has been tested to the requirements of CAN/CSA-C22.2 No. 61010-1, Second Edition, Including Amendment 1, or a later version of the same Standard incorporating the same level of testing requirements.

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List of Installation Illustrations

Illustrations by Number:

1 HelioSentry® Knockouts, (View of enclosure bottom)
2 HelioSentry®, Front View
3 All HelioSentry® Internal Connections
4 HelioSentry® Utility Connections
5 HelioSentry® Array #1 Connections (Neutral, Ground, Line 1)
6 HelioSentry® Array #2 Connections (Neutral, Ground, Line 2)
7 “Home Run Cable” – End View

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HelioSentry®

User's Manual

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Revision 7.0
May, 2010

Chapter 1 - Getting Started

The HelioSentry® has a built-in display to show the status of your solar panel installation. The menu system is designed to be easy to navigate so information can be accessed easily. Information is displayed in the top three lines of the screen. The bottom line contains four labels separated by a vertical bar " | ". These labels indicate the function of the button below it for that screen.

1.1 Screen Saver

After a minute of inactivity the LCD backlight will turn off and the screen will clear itself and a black square will march across the screen. Press any button and the display will return to the screen that was shown before the screen saver activated.

1.2 Navigating Using the Menu Buttons

The menu system uses some basic conventions to assist in navigation, item selection, and text entry.

- BACK always displays the previous screen
- OK saves the value shown on the screen
- DFLT returns a value to its factory default settings
- ++ increases a value by one increment
- - decreases a value by one increment
- << shows the previous item in a list
- >> shows the next item in a list
- 1 selects menu item 1
- 2 selects menu item 2
- -− A button that performs no action will be filled with dashes

Note: ++, -, << , and >> buttons can be held down to make scrolling faster.

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1.3 Setting the Time

When the HelioSentry® starts, it will display a screen asking for the time to be set. Setting the time allows the HelioSentry® to know when a day ends so the user can have accurate data.

If the time needs to be set then the screen will resemble Figure 1.1. Once the hour has been entered press NEXT to set the minute. The screen will resemble Figure 1.2. Once the minute has been entered press NEXT to view the HOME screen.

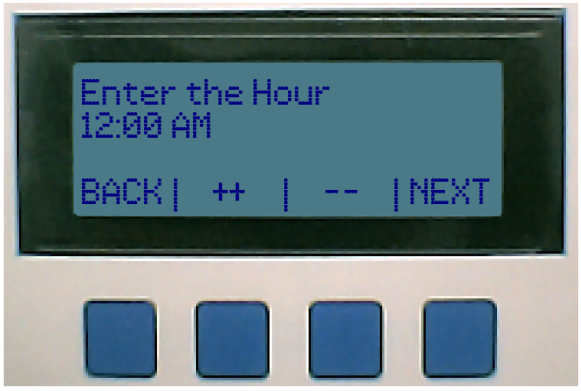

Figure 1.1: Setting the hour

- BACK returns to the HOME screen (1.4)
- ++ increases the hour
- - decreases the hour
- NEXT sets the hour and goes to the Set Minute screen

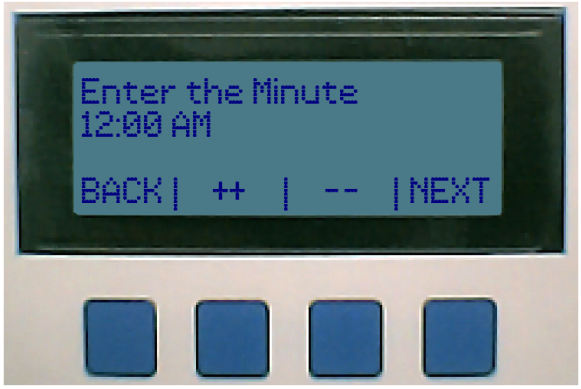

Figure 1.2: Setting the minute

- BACK returns to the hour entry screen
- ++ increases the minute
- - decreases the minute
- NEXT sets the minute and returns to the HOME screen (1.4)

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1.4 Home Screen

The HOME screen is the main screen on the HelioSentry® and is used as a reference when navigating through the display screens. To return to the HOME screen at any point press the BACK button until the display shows the home screen.

The HelioSentry® uses symbols on the top right corner of the HOME screen to provide simple status updates at a glance. If the HelioSentry® is connected to a wireless network then a 'C' will flash, otherwise an 'X' will flash. For information on connecting to a wireless network see chapter 2. If the HelioSentry® detects a problem with one or more of the solar (PV) panels, it will show a blinking '!' in the top right corner of the screen. To display the nature of the problem, press the STAT button and see section 1.6. The HelioSentry® indicates that power is being produced by a flashing 'P' in the top right corner of the screen. If this 'P' is not shown then it means that the HelioSentry® is not receiving data from the solar panels. This is normal when there is not enough sunlight for the solar panels to produce power.

An example of the HOME screen can be seen in Figure 1.3.

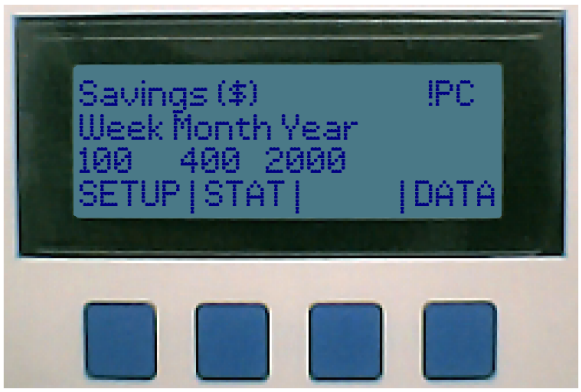

Figure 1.3: Home screen example

- SETUP goes to the Setup screen (1.5)
- STAT goes to the PV Panel Status screen (1.6)
- DATA goes to the Energy Data screen (1.7)

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1.5 Setup

The Setup screen looks like the example shown in Figure 1.4. Press 1 to configure the wireless network connection. Press 2 for more options. Press RATE to enter the utility billing rate.

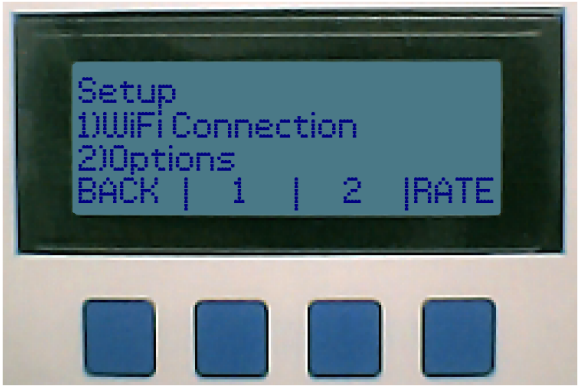

Figure 1.4: Setup screen example

- BACK returns to the HOME screen (1.4)
- 1 (WiFi Connection) (2)
- 2 (Options) (5)
- RATE goes to the Utility billing rate screen (1.5.3)

1.5.1 WiFi Connection

See chapter 2 for details on connecting to a wireless network.

1.5.2 Options

See chapter 5 for details on setting the HelioSentry® options.

1.5.3 Utility Billing Rate

The HelioSentry® can estimate the amount of money saved by using solar power[1]. This is calculated by simply multiplying the $ per kilowatt hour value by the amount of energy produced this week, month, and year. To enter the utility billing rate press the SETUP button on the HOME screen then press RATE. The screen will resemble the example shown in Figure 1.5. This is only a simple estimate. It may differ from the utility bill, and may not reflect actual money saved on a utility bill.

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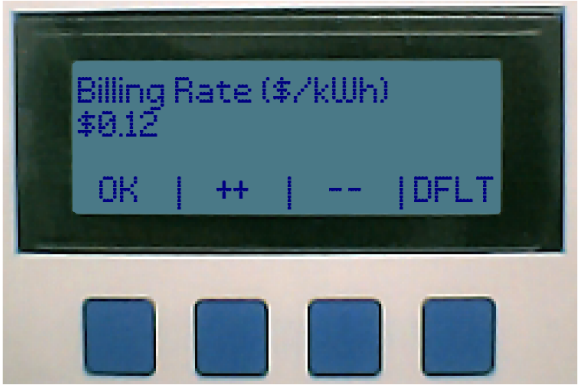

Figure 1.5: Utility billing rate screen example

- OK sets the rate and goes to the Setup screen (1.5)
- ++ increases the rate
- - decreases the rate
- DFLT resets the rate to the default value

1.6 PV Panel Status

If the solar panels are performing as expected then the screen will resemble Figure 1.6(a). If there is not enough sunlight to produce power then the screen will resemble Figure 1.6(b). This condition will occur on very cloudy days, dawn, and dusk. If a solar panel produced less energy today than it did yesterday and there was as much sunlight as yesterday then the screen will resemble Figure 1.7. This condition can be caused by an obstruction like branches, leaves, or dirt covering the solar panel.

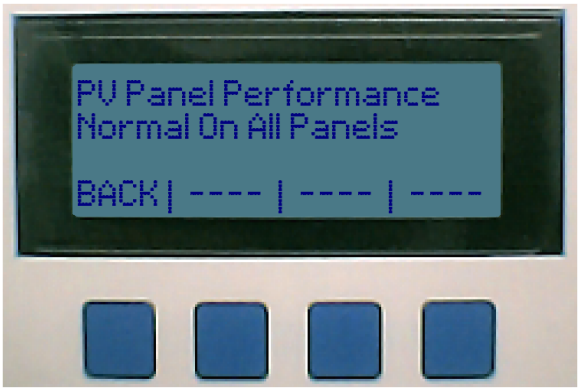

Figure 1.6: Solar panel status message example

- BACK returns to the HOME screen (1.4)

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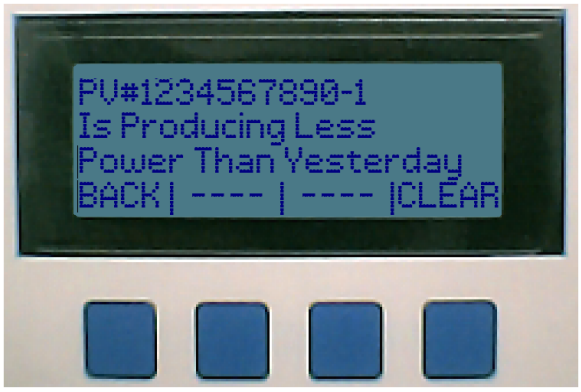

Figure 1.7: Solar panel status message example (low energy output)

- OK sets the rate and goes to the HOME screen (1.4)
- CLEAR clears the message for this solar panel

1.7 Energy Data

To view the energy data recorded by the HelioSentry®, press the DATA button on the HOME screen. See chapter 3 for details.

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Chapter 2 - Wireless Network

The HelioSentry® requires a connection to a wireless network in order to send energy data to a computer running the HelioSentry® monitoring software. This chapter will explain how to connect the HelioSentry® to a wireless network or a computer that has wireless network access.

2.1 Configuration

From the home screen press SETUP then 1 (WiFi Connection) to access the Wireless Network Connection screen. If the HelioSentry® is connected to a wireless network, then this screen will resemble the example shown in Figure 2.1(a). Otherwise the screen will resemble Figure 2.1(b).

(a) Connected (b) Disconnected

Figure 2.1: Wireless network configuration screen

- BACK returns to the Setup screen (1.5)
- MODE goes the Change Connection Mode screen (2.4)
- SSID goes the Wireless Access Point Selection screen (2.2.1)
- INFO goes the Wireless Network Adapter Details screen (2.7)

The HelioSentry® can connect to either an Infrastructure or Ad Hoc wireless network. To connect the HelioSentry® to a wireless router or wireless access point follow the instructions in section 2.2. To connect the HelioSentry® to a computer with a wireless network card follow the instructions in section 2.3.

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2.2 Wireless Access Point

Note: If the network mode has been changed to Ad Hoc it will have to be reset to Infrastructure before continuing. See section 2.4 for instructions on changing the network mode.

The following information is required in order to set-up the wireless network connection. If this information is not known, contact your wireless network support for assistance.

- The SSID (name) of the wireless network
- The password (if encrypted)
- The encryption type (manual connection only)

2.2.1 Viewing Available Wireless Networks

Press the SSID button to show the list of wireless access points found. If the HelioSentry® has detected at least one access point in range the screen will resemble the example in Figure 2.2. Proceed to section 2.2.2 to select a wireless access point. If the screen looks like Figure 2.3 then the HelioSentry® was unable to find an access point in range. If this is the case then there are two options, re-scan for access points and manual entry.

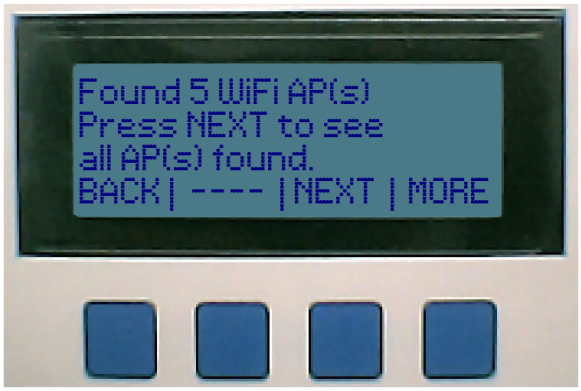

Figure 2.2: Wireless networks found

- BACK returns to the Wireless Network Configuration screen (2.1)
- NEXT goes the Wireless Access Point Selection screen (2.2.2)
- MORE goes the Re-scan and Manual Entry screen (2.2.3)

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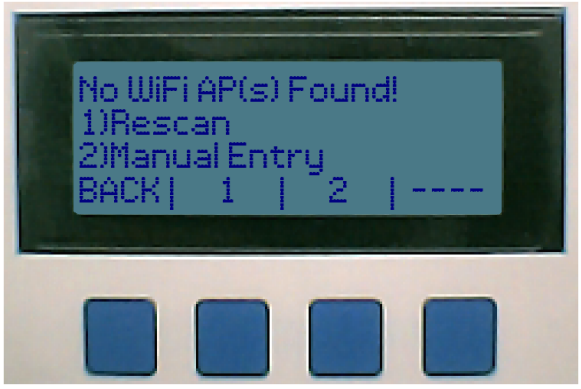

Figure 2.3: Wireless networks not found

- BACK returns to the Wireless Network Configuration screen (2.1)
- 1 (Rescan) the HelioSentry® will re-scan for wireless networks in range (2.2.3)
- 2 (Manual Entry) goes to the Manual Wireless Connection screen (2.5)

2.2.2 Wireless Access Point Selector

The Wireless Access Point Selector screen resembles the example shown in Figure 2.4. The first line shows the SSID of the wireless network. The second line shows the encryption type (Enc) and signal strength ("Str"). Use the **<<** and **>>** buttons to navigate thorough the list of wireless networks. Press OK to connect to the network shown on the screen.

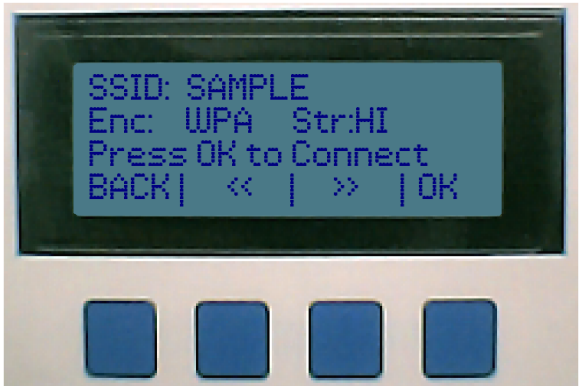

Figure 2.4: Wireless access point selector screen example

- BACK returns to the Wireless Network Configuration screen (2.1)
- **<<** shows the data for the previous access point
- **>>** shows the data for the next access point
- OK connects to this access point

If encryption is enabled then a password will need to be entered. See section 2.6 for instructions.

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If the encryption type is NONE then the HelioSentry® will connect to this access point immediately and the screen will resemble Figure 2.5. The second line shows the assigned IP address. The third line shows the number of seconds since the HelioSentry® started the connection process. If the connection process takes more than 60 seconds the process will abort and the screen will resemble Figure 2.6. If the connection process is successful then the HelioSentry® will return to the Wireless Network Configuration screen (2.1).

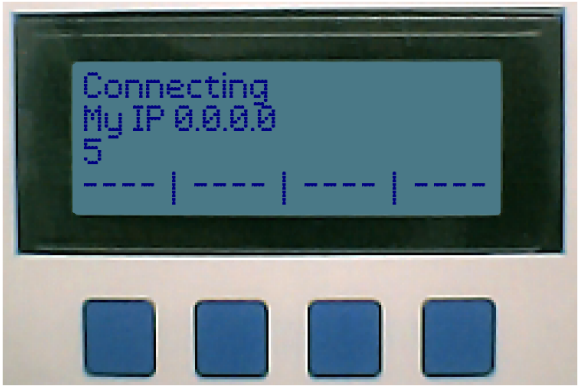

Figure 2.5: Connecting to a wireless access point

Figure 2.6: Unable to connect to a wireless access point

- BACK returns to the Wireless Network Configuration screen (2.1)

2.2.3 Re-scanning for Wireless Networks

The Manual Re-scan screen looks like the example shown in Figure 2.7. The screen will resemble Figure 2.8 while the scan is running. If the HelioSentry® did not find any wireless networks in range or it did not find the desired wireless network it may be beneficial to perform a manual re-scan. If the network is still not listed then the SSID may be manually entered.

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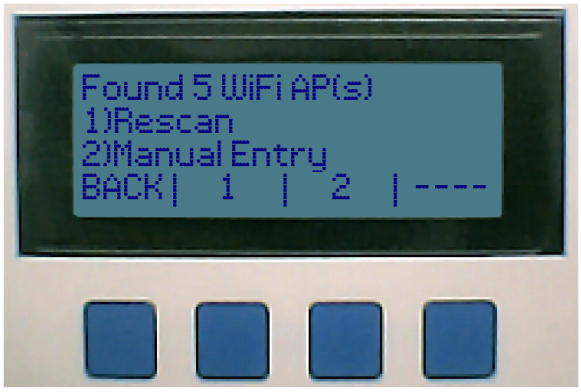

Figure 2.7: Re-scan and manual entry screen example

- BACK returns to the Wireless Network Configuration screen (2.1)
- 1 (Rescan) the HelioSentry® will re-scan for wireless networks in range (2.2.3)
- 2 (Manual Entry) goes to the Manual Wireless Connection screen (2.5)

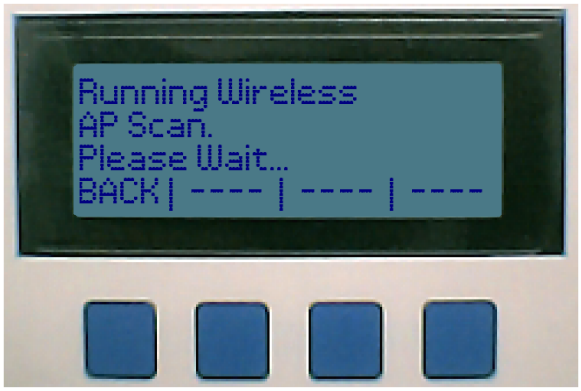

Figure 2.8: Re-scan in progress screen example

- BACK returns to the Wireless Network Configuration screen (2.1)

2.3 Ad-Hoc Network

The HelioSentry® will create an Ad Hoc network and configure itself automatically. The system will create an Ad Hoc network called SolarS01 with no encryption and a random IP address in the 169.254.0.0 range. The computer that is connecting to the HelioSentry® will need to connect to this Ad Hoc network and also have an IP address configured in the 169.254.0.0 range. Follow the instructions in section 2.4 to activate Ad Hoc mode.

Once Ad Hoc mode has been enabled the Wireless Access Point Selection screen will resemble the example shown in Figure 2.9

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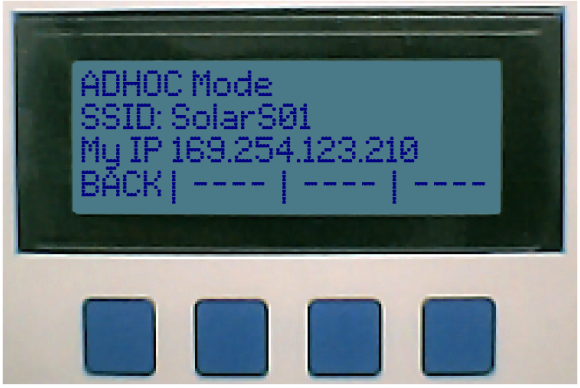


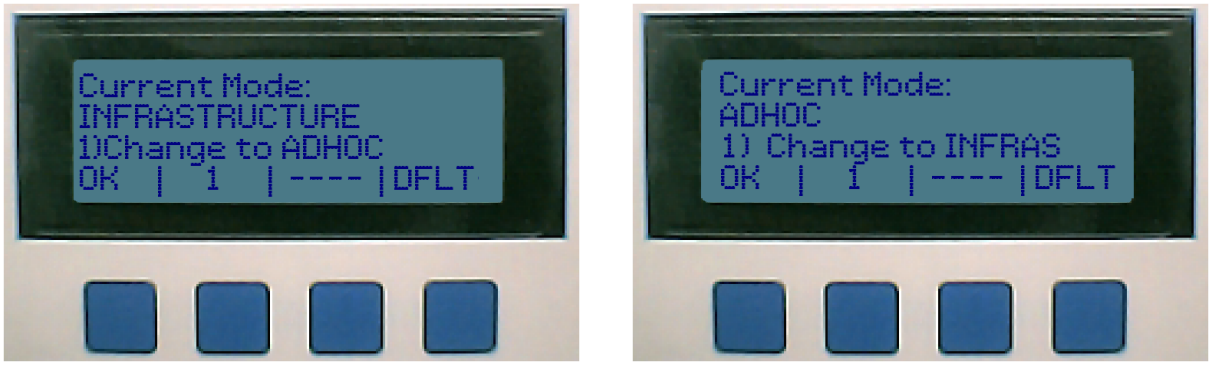
Figure 2.9: Ad Hoc wireless access point selection screen example

- BACK returns to the Wireless Network Configuration screen (2.1)

2.4 Wireless Network Mode

The HelioSentry® is setup by default to connect to Infrastructure type wireless access points (AP). Ad Hock mode can be enabled to allow a computer to connect directly to the HelioSentry® in the event that a wireless access point is not available.

To configure the HelioSentry® for Ad Hoc networking press MODE. The screen will resemble the example in Figure 2.10(b). Press 1 to change the Current Mode to Ad Hoc. The Current Mode will be set to Ad Hoc now and the screen will resemble Figure 2.10(a). Press OK to confirm the change.



(a) Infrastructure Mode (b) Ad Hoc Mode

Figure 2.10: Wireless network connection modes

- OK sets the mode and returns to the Wireless Network Config. screen (2.1)
- 1 Changes the mode
- DFLT changes the mode to the default value (Infrastructure)

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2.5 Manual Wireless Connection

The Manual Wireless Connection screen resembles Figure 2.11. Use the **<<** and **>>** buttons to select a character. The character inside the brackets "[ ]" is the selected character. Press ENTER to insert the character.

Once this process has been started it must be completed. Note: SSID are case sensitive.

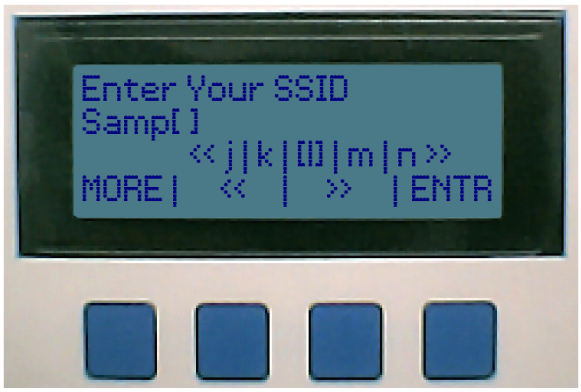

Figure 2.11: Manual wireless connection example 1

- MORE changes the menu to the one shown in Figure (2.12)
- **<<** selects the previous character
- **>>** selects the next character
- ENTR ("ENTER") inputs the selected character and advances the cursor

Press MORE to switch to the additional menu bar (Figure 2.12). To erase, press BKSP. To finish, press DONE to go to the confirmation screen. To clear the entry, press CLEAR.

Figure 2.12: Manual wireless connection example 2

- BACK changes the menu to the one shown in Figure 2.11
- BKSP deletes the previous character (if any)
- DONE goes to the confirmation screen shown in Figure 2.13
- CLEAR clears the text that was entered

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When the SSID has been entered press the DONE button to show the confirmation screen as seen in Figure 2.13.

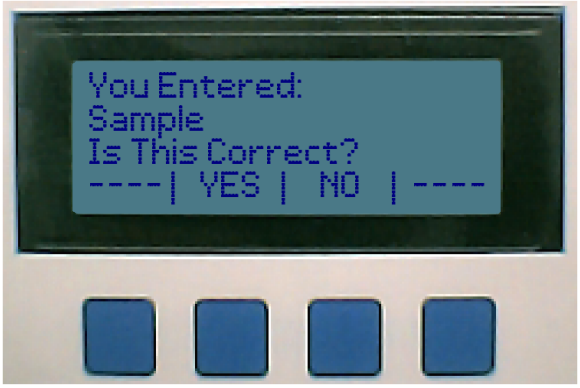

Figure 2.13: Manual wireless connection confirmation example

- YES goes to the Encryption Selector screen shown in Figure 2.14
- NO returns to the Manual Wireless Connection screen (2.5)

Use the **<<** and **>>** buttons to select the encryption type. The available options are:

- NONE
- WEP 64 bit
- WEP 128 bit
- WPA1
- WPA2

If the connection is not encrypted, choose NONE. The NEXT button will go to the Connecting screen (Figure 2.5) if encryption is “NONE”, otherwise it will go to the password entry screen. See section 2.6 for details on password entry.

Figure 2.14: Manual wireless connection encryption example

- NEXT goes to the Password Entry screen if encryption is enabled (2.6)

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2.6 Wireless Network Password Entry

There are 6 different types of passwords that may be entered into the HelioSentry®. The type of password depends on the encryption type.

- WEP 64 bit HEX has exactly 10 characters
- WEP 64 bit TEXT has exactly 5 characters
- WEP 128 bit HEX has exactly 26 characters
- WEP 128 bit TEXT has exactly 13 characters
- WPA HEX can be up to 63 characters long
- WPA TEXT can be up to 32 characters long

The Password Type Selection screen resembles Figure 2.15. If the password is in hexadecimal format (HEX), choose HEX. If the password is in text (words, numbers, symbols) format ,choose TEXT.

The password will appear in plan text as it is entered.
The password will not be shown again after it is confirmed.

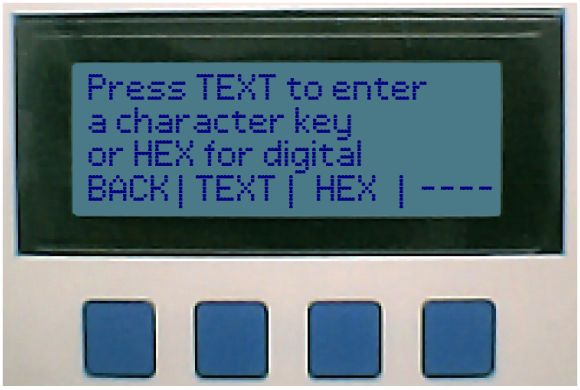

Figure 2.15: Password type selection example

- BACK returns to the Wireless Network Selector screen (2.2.2)
- TEXT goes to the Password Entry screen with text character set (2.6.1)
- HEX goes to the Password Entry screen with hex character set (2.6.1)

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2.6.1 Password Entry

The Password Entry screen resembles Figure 2.16. Use the << and >> buttons to select a character to enter. The character inside the [ ] indicates the selected character. Press ENTER to insert the character inside the [ ] on line three into the [ ] on line two.

If HEX was selected on the Password Type Selection screen, character choices will be limited to the numbers 0 to 9 and letters A to F, as these are the only valid characters for a HEX type password. If TEXT was selected a full range of capital and lower case letters are available along with numbers 0 to 9 and special symbols. The steps for password entry are the same regardless of the type of password.

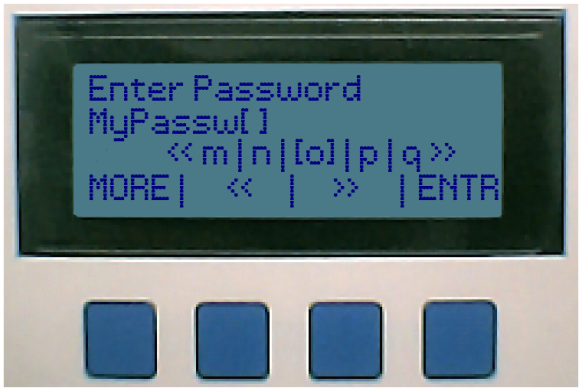

Figure 2.16: Password entry example 1

- MORE changes the menu to the one shown in Figure (2.17)
- << selects the previous character
- >> selects the next character
- ENTER inputs the selected character and advances the cursor

Press MORE to switch to the additional menu bar as seen in Figure 2.17. To erase a mistake, press BKSP. To finish the entry, press DONE to go to the confirmation screen. To completely clear the entry, press CLEAR.

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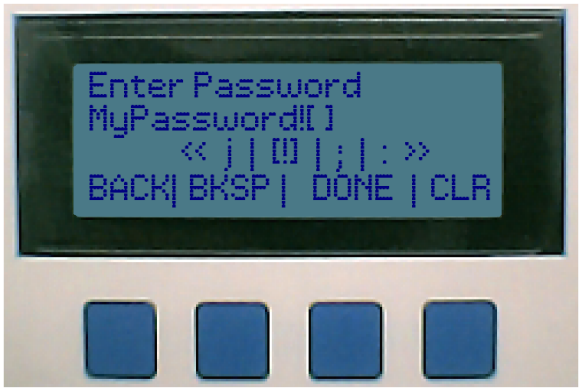

Figure 2.17: Password entry example 2

- BACK changes the menu to the one shown in Figure 2.16
- BKSP deletes the previous character (if any)
- DONE goes to the confirmation screen shown in Figure 2.18
- CLEAR clears the text that was entered

When the password has been entered press the DONE button to show the confirmation screen as seen in Figure 2.18.

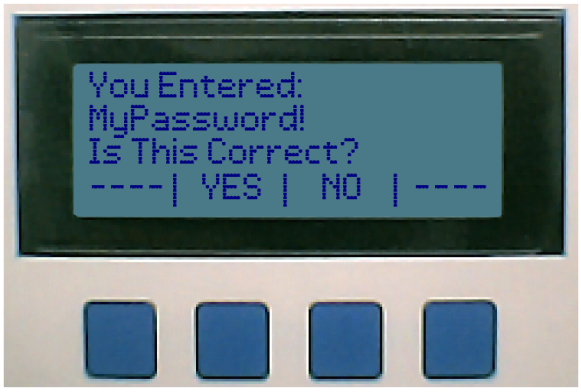

Figure 2.18: Password confirmation example

- YES goes to the Connection screen shown in Figure 2.5
- NO returns to the Password Entry screen (2.16)

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2.7 Wireless Network Adapter Details

The Wireless Network Adapter screen resembles the example shown in Figure 2.19. The second line shows the MAC address of the wireless network adapter. The third line shows the IP address assigned to the HelioSentry®.

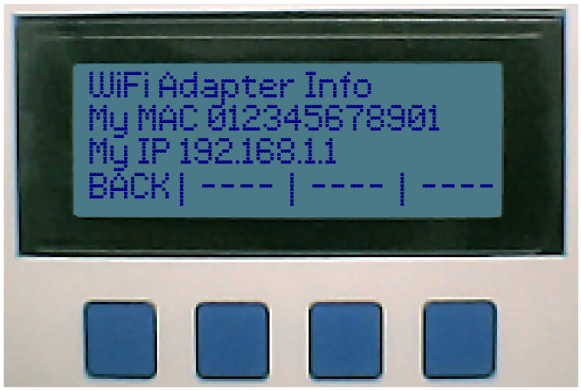

Figure 2.19: Wireless network adapter example screen

- BACK returns to the Password Entry screen (2.6)

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Chapter 3 - Energy Data

From the HOME screen press DATA to access the Energy Production Data screen.

3.1 Energy Production Data (Live)

An example of the live energy production screen appears in Figure 3.1. The first line shows the solar panel (PV) total power output at the moment and the total energy output so far today. The second line shows the utility grid (UTL) power usage at the moment and the total energy usage so far today. The third line shows the sum of the PV and UTL columns (NET).

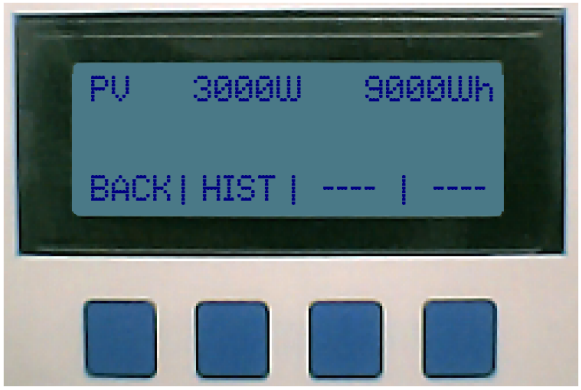

Figure 3.1: Energy production data screen

- BACK returns to the HOME screen (1.4)
- HIST goes to the Energy History Data screen (3.2)

IMPORTANT NOTE! PVAC Modules measure and communicate their power readings approximately once per minute. The HelioSentry® takes actual total power readings every few seconds. For this reason, the total power, if summed for each individual AC Module, may not agree with the total power measured and displayed by the HelioSentry®. Differences up to 10% or more between the two power values are not an indication of trouble. Compare the power output readings of various PVAC Modules. They'll generally be similar, depending on the weather. Fast-moving clouds and other conditions can cause wide differences in reported wattages among PVAC Modules. Readings taken over 10-15 minutes of time are more meaningful.

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3.2 Energy History Data

The HelioSentry® stores the following information for a period of 35 days:

- Power output of each PV panel every minute
- Utility power usage every minute
- Total daily energy production for each panel
- Daily high and low temperatures
- Daily degree hours
- Daily peak irradiance
- Daily irradiance hours

The HelioSentry® also keeps a data record of the energy produced for each day for the past 365 days, 52 weeks, 12 months, 2 years, and for all-time (from the first day of use).

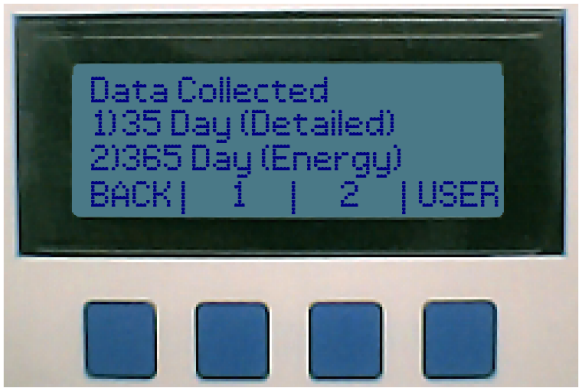

Figure 3.2: History data selection screen

- BACK returns to the Energy Data screen (3.1)
- 1 (35 Day (Detailed)) (3.3)
- 2 (365 Day (Energy)) (3.4)
- USER goes to the Resettable Energy Counters screen (3.5)

3.3 The Past 35 Days

The 35 Day Detailed History screen resembles Figure 3.3.

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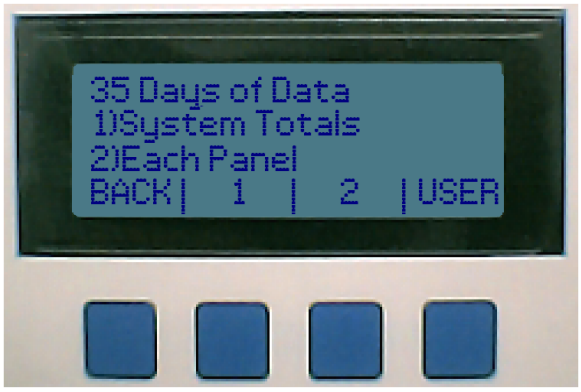

Figure 3.3: 35 Day history selection screen

- BACK returns to the History Data Selection screen (3.2)
- 1 (System Totals) (3.3.1)
- 2 (Each Panel) (3.3.2)

3.3.1 Daily Detailed Energy History

The Daily Detailed Energy History screen resembles Figure 3.4. Line 2 shows the peak power for the day; Line 3 shows the total energy produced that day.

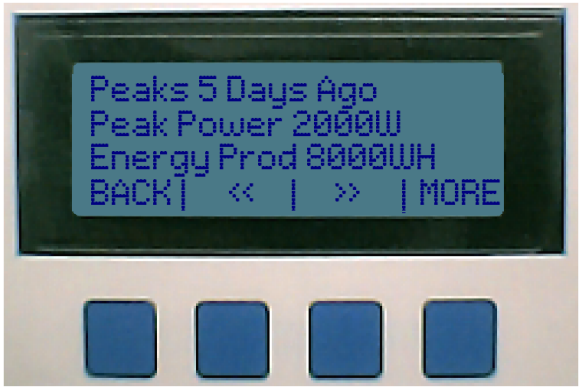

Figure 3.4: Daily detailed energy history screen example

- BACK returns to the 35 Day Detailed History screen (3.3)
- << shows the data for the previous day
- >> shows the data for the next day
- MORE goes to the temperature data for the selected day (3.3.1.1)

3.3.2 Each Panel

The Daily Detailed Panel Energy History screen resembles Figure 3.8. Select the day to view data for using the << and >> buttons then press OK.

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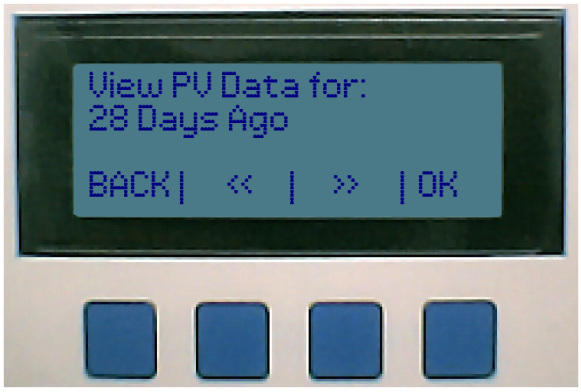

Figure 3.8: Daily detailed panel energy history screen example

- BACK returns to the 35 Day Detailed History screen (3.2)
- << selects the previous day
- >> selects the next day
- OK goes to the Daily Solar Panel Energy History screen (3.3.2.1)

3.3.2.1 Daily Solar Panel Energy History

The Daily Solar Panel Energy History screen resembles Figure 3.9. Select the solar panel to view data for using the << and >> buttons. The first line is the serial number of the AC Module attached to the solar panel. The second line shows the peak power level reached that day. If the data for today is being viewed this line will show the current power output and AC line voltage. The third line shows the energy produced by the module. Press MORE to view sensor data for this solar panel.

If the data shown is all 0's, that indicates there's no solar panel data in that location.

Figure 3.9: Daily solar panel energy history screen example

- BACK returns to the 35 Day Detailed History screen (3.2)
- << selects the previous solar panel AC Module
- >> selects the next solar panel AC Module
- MORE goes to the Irradiance screen (3.3.2.2)

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3.3.2.2 Reserved for Future Use
3.3.2.3 Reserved for Future Use

3.3.2.4 Daily Solar Panel Status Code History

The Daily Solar Panel Status History screen resembles Figure 3.12. This screen shows various status codes generated by the AC Module during the day. Status codes are used for advanced troubleshooting by service personnel. See Table 1 and Appendix A (page 64).

TABLE 1

Code	Description	Code	Description
8A	Abnormal line frequency	8D	AC line voltage greater than 132Vac
8B	AC line voltage less than 60Vac	8E	AC line voltage greater than 144Vac
8C	AC line voltage less than 105Vac		

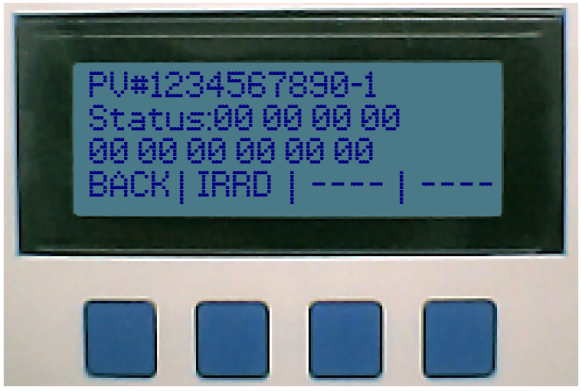

Figure 3.12: Daily solar panel status history screen example

- BACK returns to the Daily Solar Panel Energy History (3.3.2.1)
- IRRD goes to the Daily Solar Panel Irradiance History screen (3.3.2.3)

3.4 The Past 365 Days

The 365 day summary consists of the solar energy production and utility power usage recorded by the HelioSentry®.

3.4.1 Daily

The Daily Summary Energy History screen resembles Figure 3.13. The second line shows the energy production for the day.

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Figure 3.13: Daily detailed degree hour history screen example

- BACK returns to the History Data Selection screen (3.2)
- << shows the data for the previous day
- >> shows the data for the next day
- WEEK goes to the Weekly Summary Energy History screen (3.4.2)

3.4.2 Weekly

The Weekly Summary Energy History screen resembles Figure 3.14. The second line shows the energy production for the week.

Figure 3.14: Weekly detailed degree hour history screen example

- BACK returns to the Daily Summary Energy History screen (3.4.1)
- << shows the data for the previous week
- >> shows the data for the next week
- MONTH goes to the Monthly Summary Energy History screen (3.4.3)

3.4.3 Monthly

The Monthly Summary Energy History screen resembles Figure 3.15. Line 2 shows energy production for the month.

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Figure 3.15: Monthly detailed degree hour history screen example

- BACK returns to the Weekly Summary Energy History screen (3.4.2)
- << shows the data for the previous month
- >> shows the data for the next month
- YEAR goes to the Yearly Summary Energy History screen (3.4.4)

3.4.4 Yearly

The Yearly Summary Energy History screen resembles Figure 3.16. The second line shows the energy production for the year.

Figure 3.16: Yearly detailed degree hour history screen example

- BACK returns to the Daily Summary Energy History screen (3.4.1)
- << shows the data for the previous year
- >> shows the data for the next year
- TOTAL goes to the All-Time Summary Energy History screen (3.4.5)

3.4.5 All Time

The All-Time Summary Energy History screen resembles Figure 3.17. The second line shows the energy production for the year.

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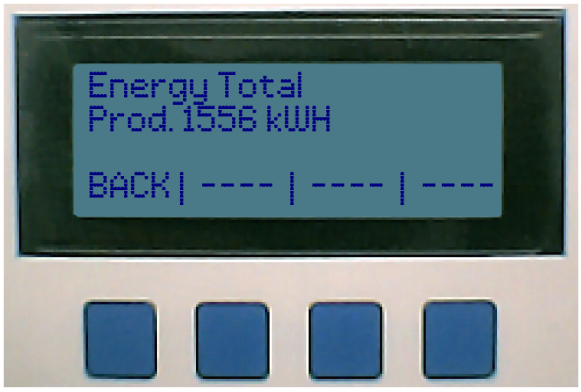

Figure 3.17: All-Time summary energy history screen example

- BACK returns to the Yearly Summary Energy History screen (3.4.4)

3.5 Resettable Energy Counters

The Resettable Energy Counters screen resembles Figure 3.18. The HelioSentry® has 3 solar energy and utility energy counters that can be individually reset. These counters can be used to record the energy used between two points in time.

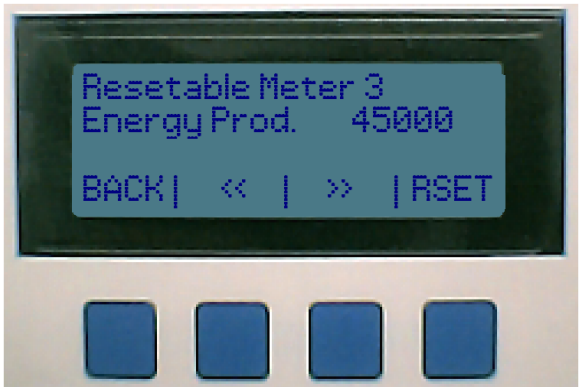

Figure 3.18: Resettable energy counters screen example

- BACK returns to the History Data Selection screen (3.2)
- << shows the data for the previous counter
- >> shows the data for the next counter
- RESET goes to the Counter Reset screen. (3.5.1)

3.5.1 Counter Reset

The solar energy and utility energy data can be reset independently of each other.

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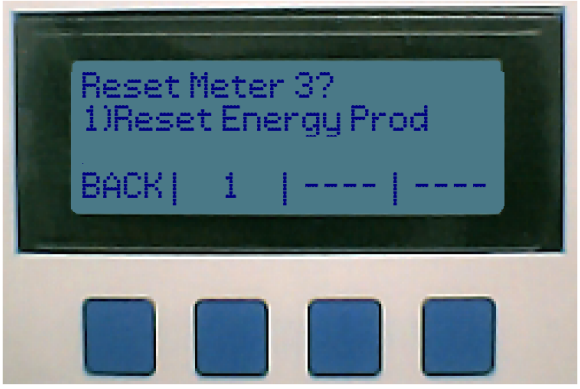

Figure 3.19: Resettable energy counters reset screen example

- BACK returns to the Resettable Energy Counters screen (3.5)
- 1 resets the solar energy produced data

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Chapter 4
(Reserved for Future Use)

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Chapter 5 - Options

From the HOME screen press SETUP to show the Setup screen, then press 2 (Options). The screen will resemble Figure 5.1.

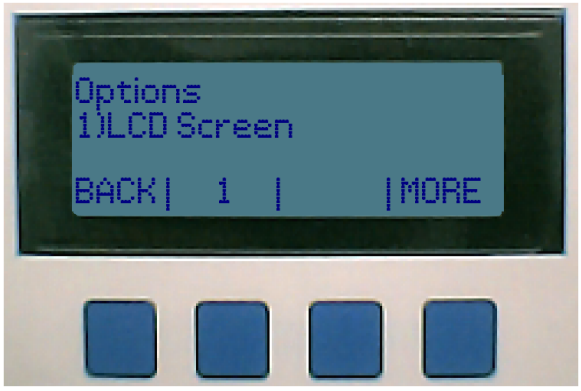

Figure 5.1: Options screen example

- BACK returns to the Setup screen (1.5)
- 1 (LCD Screen) goes to the LCD Options screen (5.1)
- MORE goes to the Advanced Options screen (5.3)

5.1 LCD Screen

The HelioSentry® LCD screen can be set to have the backlight turn off after a period of time. The contrast can be adjusted for optimum visibility.

Figure 5.2: LCD option screen

- BACK returns to the Options screen (5)
- 1 (Back Light) (5.1.1)
- 2 (Contrast) (5.1.2)

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- VER goes to the Software Version screen (5.1.3)

5.1.1 Backlight

An example of the backlight option screen can be seen in Figure 5.3.

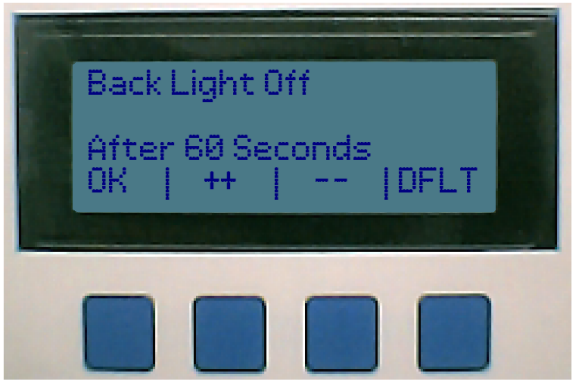

Figure 5.3: LCD backlight options example

- OK sets the value and goes to the LCD Options screen (5.1)
- ++ increases the seconds by 5
- - decreases the seconds by 5
- DFLT resets the seconds to the default value

5.1.2 Contrast

An example of the contrast option screen can be seen in Figure 5.4.

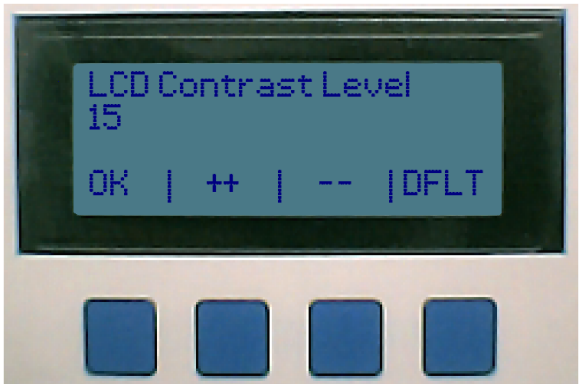

Figure 5.4: LCD contrast options example

- OK sets the value and goes to the LCD Options screen (5.1)
- ++ increases the contrast
- - decreases the contrast
- DFLT resets the contrast to the default value

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5.1.3 Software Version

An example of the Software Version screen can be seen in Figure 5.5. This screen is used for technical support purposes.

Figure 5.5: Software version screen example

- BACK returns to the LCD Options screen (5.1)

5.2.3 Energy Data Transmission

The energy data transmission timing can be set using this screen.

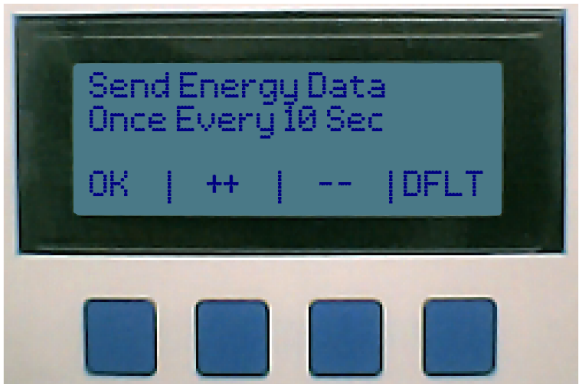

Figure 5.9: Energy data transmission timing example

- OK sets the value and returns to the Sensor Options screen (5.2)
- ++ increases the time
- - decreases the time
- DFLT resets the time to the default value

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5.3 Advanced Options

The advanced options are to be used in case the system data needs to be reset, collision detection needs to be enabled, or the time needs to be set.

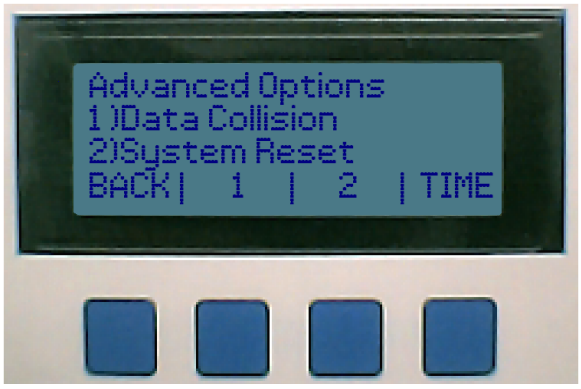

Figure 5.11: Advanced options screen

- BACK returns to the Options screen (5)
- 1 (Data Collision) (5.3.1)
- 2 (System Reset) (5.3.2)
- TIME goes to the Time Setup screen (5.3.3)

5.3.1 Data Collision

The data collision detection can be enabled or disabled using this screen. Enabling the collision detection feature may improve communications in electrically noisy environments. This option is disabled by default.

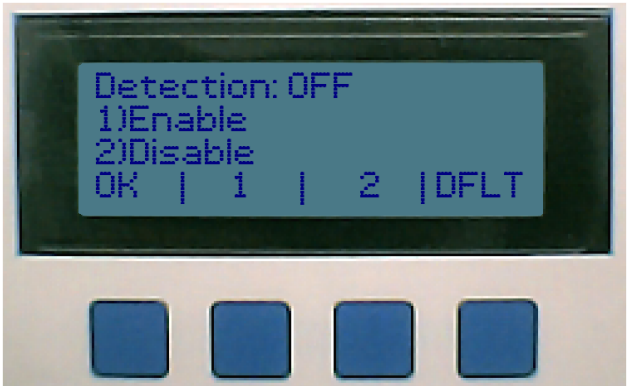

Figure 5.12: Data collision detection example

- OK sets the collision detection and returns to the Advanced Options screen (5.3)
- 1 (Enable) sets the collision detection to ON
- 2 (Disable) sets the collision detection to OFF
- DFLT resets the collision detection to the default value

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5.3.2 System Reset

The saved settings and stored data can be reset using this screen. The System Reset screen resembles Figure (5.13). Once the system reset is in process, the screen will resemble Figure (5.14).

Warning! The HelioSentry® will NOT ask for confirmation before reset, which will delete data. Pressing any button on this screen other than "BACK" will result in data loss!

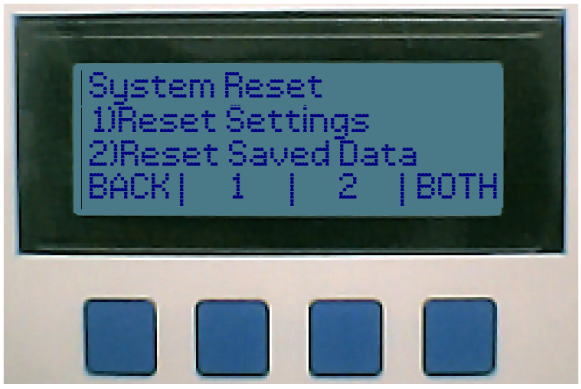

Figure 5.13: System reset screen

- BACK returns to the Advanced Options screen (5.3)
- 1 (Reset Settings) resets all options to factory defaults
- 2 (Reset Saved Data) clears the on-board memory of all saved energy data
- BOTH resets settings and the saved data

Figure 5.14: System reset message screen

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5.3.3 System Time

The system time can be manually set using the instructions found in section 1.3. The HelioSentry® will return to the Advanced Options screen after setting the time from this menu option.

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GLOSSARY

AC Module	Electrical device permanently attached to a photovoltaic module, and which generates alternating current.
Ad-Hoc	A decentralized wireless network. The network is "ad hoc" because it does not rely on a pre-existing infrastructure.
Amperes (amps)	Quantity of electrical current.
CSA	Canadian Standards Association
ETL	Also called “Intertek”, or “ETL Semko”. Intertek is the world's largest testing, inspection and safety certification agency. They test and certify equipment to all applicable UL Safety Standards. (See also “UL”.)
FCC	Federal Communications Commission
IEEE	Institute of Electrical and Electronic Engineers
Inverter	Electrical device that converts direct current into alternating current.
Natural Convection	Movement of air without assistance of any mechanical or other device.
Network	Two or more computers or computerized devices that communicate with each other electronically for the purposes of sharing data.
NFPA	National Fire Protection Association
Photovoltaic Module	Generates direct current electricity from sunlight
PV	See “Photovoltaic Module”
Real-time	Occurring immediately. Not delayed. Data being read in “real time” is accurate to within a few seconds of time of its reading.
Software	A computer program.
Switch lockout ("lockout")	Mechanical switch that disconnects the flow of electricity, and through which either by inserting a lock, or by other means, can the switch be kept in the “open” (disconnected) state until manually closed again.
UL	Underwriters Laboratories. A nationally recognized testing laboratory and safety certification agency.
Utility grid	The complex maze of wires through which our electricity flows.
Volts (Voltage)	Quantity of electrical pressure.
WiFi	Popular term for a high-frequency wireless local area computer network.
Wireless Network	Any type of computer network that is wireless (doesn't connect various pieces of equipment using wires and/or cables).

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Appendix A – Status Error Codes

Status Code	Description	Result
8A	Abnormal line frequency.	AC Module will recover in 5 minutes.
8B	AC line voltage less than 60Vac.	AC Module will recover in 5 minutes.
8C	AC line voltage less than 105Vac.	AC Module will recover in 5 minutes.
8D	AC line voltage greater than 132Vac.	AC Module will recover in 5 minutes.
8E	AC line voltage greater than 144Vac.	AC Module will recover in 5 minutes.

No action is required on the part of the user for any of the above error codes labeled 8A through 8E. The inverter will self-recover from any of these conditions.

If an error code other than those above is displayed, contact your installer or your distributor for assistance.

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